IN TWO SECTIONS: CURRENT NEWS SECTION

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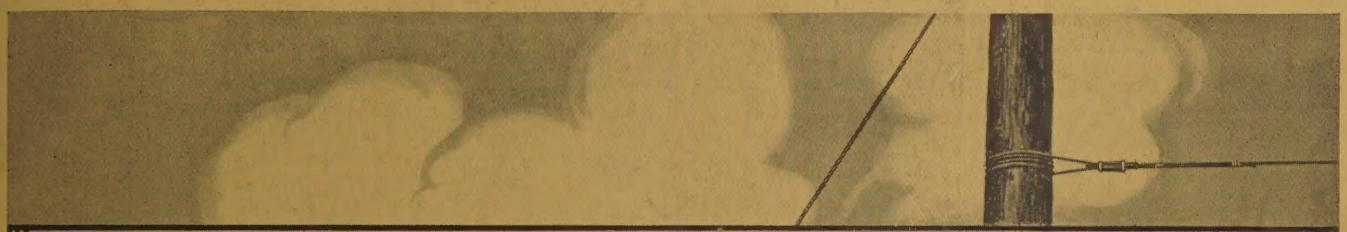

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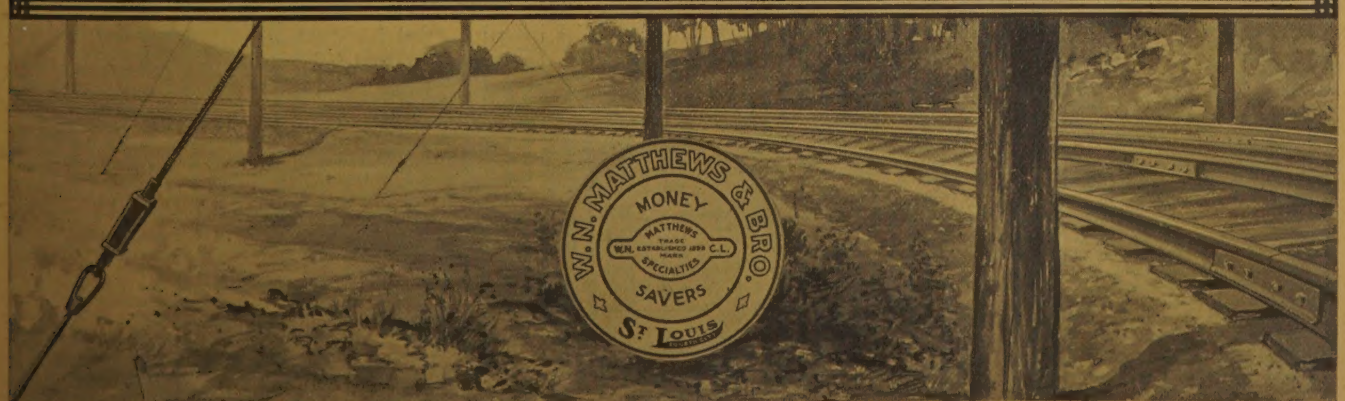

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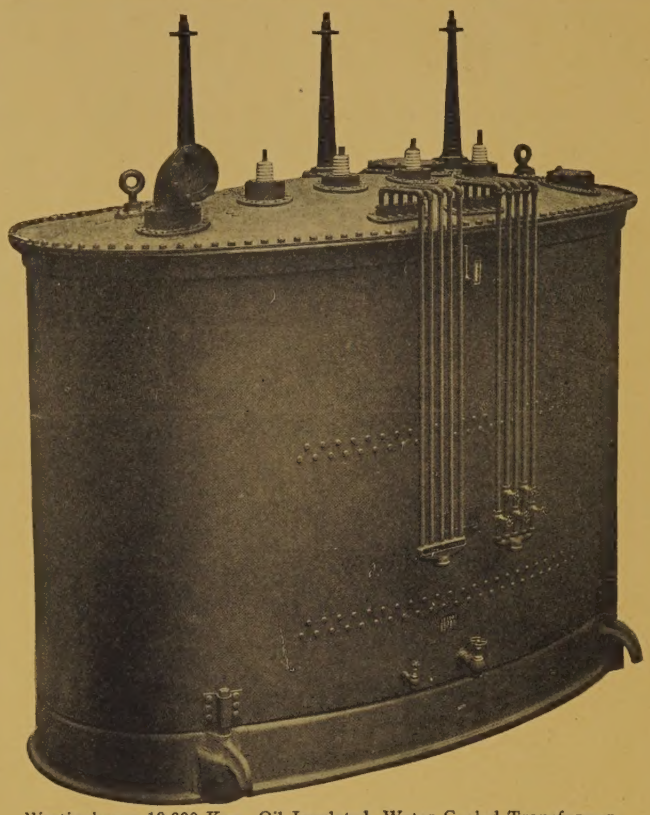

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Electric Railway Journal

A CONSOLIDATION OF STREET RAILWAY JOURNAL AND ELECTRIC RAILWAY REVIEW

Vol. XL NEW YORK, SATURDAY, OCTOBER 5, 1912 No. 14

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CONVENTION ISSUE

This issue of the ELECTRIC RAILWAY JOURNAL is published in two sections, one the news section similar to that published fifty-two times during the year, and the other our usual convention number. For many years we have published a special issue of the ELECTRIC RAILWAY JOURNAL just prior to the convention of the American Electric Railway Association and have chosen for the general subject of that number the electric railway facilities of the city at which the convention is to be held or some other topic which was of live interest in the electric railway field at the time. In many respects the electric railway systems in and about Chicago demand world-wide attention just now. In the first place, the surface systems have been entirely rehabilitated during the past five years. Everything connected with their equipment, track, cars and overhead lines is new, and for this reason the city is a vast store of information in regard to the latest practices in electric railway engineering. In the second place, the power generation and distribution system is unique in that most of the power for the operation of the surface cars in Chicago is generated in the vast power stations of the Commonwealth Edison Company, which supplies current for commercial lighting and industrial power in Chicago, and these power stations are notable for their size and for the modern character of their equipment. In the third p'ace, the franchise conditions of the surface railways in Chicago are novel. The city is a laboratory in which a new form of contractual relation between the municipality and the surface railways is being tested, a plan which does not involve municipal ownership nor purely private control but a co-operative participation between the community and the companies by which the city exercises an intelligent supervision and derives a profit from car operation. Again, the city possesses the largest system of elevated railroads in existence under one management, is the center of some of the finest interurban electric railways in the country, and is conducting, with the co-operation of the steam railroads, a most elaborate investigation as to the practicability of the electrification of the steam railroads terminating in Chicago. These are not the only reasons which make the city an interesting subject of consideration by the student of electric railway subjects, but they are ample justification for our choice of a topic for our convention number this year. We hope that this issue will be of assistance to the visiting delegates as a Baedeker to the electric railways in Chicago at this time.

WATER ANALYSIS FOR POWER PLANTS

One of the most effective p'aces where chemical analysis may be used is in the testing of boiler-feed water. Once made, such a chemical analysis is good for a long period and in consequence does not involve what might be called a running expense. On a large plant, in fact, the expense is absolutely negligible. It is, of course, true that in many places, especially in the West, the quality of the water changes with the season, the surface water during the late winter and early spring having different characteristics

from water from the same source during the late summer or autumn. Changes in chemical analysis remain the same from year to year so that analysis of the water in the spring and in the fall would apply with reasonable accuracy for several years. With an operation of such low cost it is manifestly best to have it made in the best possible manner so that a really accurate analysis of what is being put into the boilers may be obtained. It does not follow, however, that because a chemist is an expert water analyst he will necessarily be also an expert adviser as to the best method of treating the water. The treatment of boiler-feed water is something which requires practical knowledge as well as a certain amount of elementary chemistry, and while it would not be advisable to trust to a man who depended absolutely upon rule-of-thumb methods for treating feed water hardly any better results would be obtained by relying upon the pure theory of an expert chemist. When water is treated, however, in the proper way it is possible to obtain savings both in economy and in boiler capacity over conditions which would exist with under-treated or over-treated water. Anyone who has happened to investigate feed-water conditions in a large number of different plants will undoubtedly have found instances where water which actually contained free sodium carbide was being treated with soda ash because the engineer in charge had had good experience in some other locality where soda ash reduced the scale-forming tendencies of calcium or magnesium sulphates. In such a plant any attempt to drive the boilers naturally would be followed by annoying if not dangerous foaming.

TWO-CAR TRAIN OPERATION

The article appearing elsewhere in this issue on the two-car trains which have just been put into service in Newark covers a phase of congested city operation which is apparently bound to come before all managers of railway properties in large cities. The estimated increase in the number of cars which can be operated past a congested corner is 33 per cent. This is based upon experience with actual operation in Newark, and while the results at present are in preliminary form, they are sufficiently definite to show that very material gains may be made in congested streets by the use of multiple units. It is, of course, undeniable that if two-car trains should be run all day long they would not only effect a marked economy in operating cost per car mile in power and platform expense but would also greatly reduce the traffic interruptions which exert a decided influence in the slowing down of city schedules. To be satisfactory from a traffic standpoint, however, two-car train operation under such circumstances is dependent upon the existence of a very short headway, as otherwise any considerable increase in headway between operating units will cause the loss of a certain number of fares. In Newark two-car trains are run only during the rush hours. During other times of the day cars are run as single units, and further experiments with two-car trains which are to be made there will throw considerable light on the relative merits of this method and of others, such as the use of the double-deck car, for dealing with the congested street problem. In favor of the two-car train, the advantages can be cited of quickness in loading and unloading, a vastly less radical departure from the accepted traditions of American railway practice, a facility for exchange of equipment during rush-hour and non-rush-hour periods, and a greater degree of standardization in equipment. On the other hand, the double-deck car includes among its advantages a lower weight per seat than either the two-car train or the single car with one deck and also less street space occupied per seat, a fact which probably corresponds with less time per seat for passing congested crossings.

THE BOSTON ARTICULATED CAR

Among the novel rolling-stock designs which have signalized the present year, that of the Boston articulated car, described elsewhere in this issue, deserves prominent mention. It represents an interesting solution of the ever-present problem of dealing with rolling stock no longer equal to the demands for economy in operation which press so hard upon the modern urban traction system. These demands come to a focus in the need of handling a greatly increased volume of traffic without augmenting the transportation payroll and have led to the development of larger cars as a natural line of attack upon existing platform costs.

Desirable as large and new cars may be, however, it is necessary in many cases to avoid too great an investment in such equipment on account of the amount of money already tied up in smaller rolling-stock units. The plan of building a large car by the physical union of two of small size has been tried in a number of instances with reasonable success, but the method of attaching them to a central compartment by a flexible connection permitting an articulated unit nearly 70 ft. long to traverse any curve negotiable by a car with a 20-ft. body is a distinct departure from former practice which promises interesting results. Such an arrangement facilitates the features of safe operation and positive fare collection through the utilization of the central compartment for entrance and exit purposes and enables the company to handle double the traffic per crew that was possible with the component cars of the articulated unit. It also reduces the danger of collisions by the lengthening of the headway for the same volume of travel and economizes in power on account of the reduction in the weight per seat compared with that obtaining with the semi-convertible car. It is probable that other cars of this type will be built at Boston embodying the stepless feature of design between the street and the platform of the middle compartment. The mechanical and operating details appear to have been well worked out and the feature of controlling the trolley from the middle compartment is particularly noteworthy.

The comparison of this car from an operating standpoint which will necessarily be made will be with the two-car train, which the car practically is except that it has a long floating vestibule. But it has the operating advantage that only one conductor is required, and as the articulated car has a seating capacity of but sixty-eight, one conductor on the prepayment plan ought to be able without difficulty to care for this number of passengers. As compared with the two-car train, the car has but one exit and entrance and that at the center, but center-entrance cars are not in as much disfavor as they once were when it was thought they would

block the cross-street unduly and were liable to accident from passengers who would fall under the rear wheels. Clean street pavements have largely reduced the first trouble, as with them a center-entrance does not have to stop directly opposite the cross-walk, and the prepayment plan where the conductor is at the platform has largely eliminated the second danger. On the other hand, the car is an indivisible double unit and has not the same operating flexibility as the two-car train. Hence it is not as well adapted to seasons of light and heavy traffic as the two-car train which can be broken up for individual car use. Again, the vestibule, as constructed, is a radical departure in car design. There is no apparent reason why it should not be satisfactory, but time only will determine its practicability. Finally, the company not only saves scrapping or marketing its investment in existing rolling stock by the use of the articulated design, but it also is spared a corresponding increased expenditure for new cars and costly track and bridge changes entailed by larger cars.

The car is admittedly still an experiment, but as such it illustrates the increased attention being given to car design and the many directions from which this subject is being approached.

CENTRAL STATION POWER IN CHICAGO

The discussion of the use of purchased power by the surface and elevated railways in Chicago by Professor Norris, appearing elsewhere in this issue, is in the main a decidedly strong brief in favor of the plan. Of the various reasons which the author advances for the nearly general use of Commonwealth Edison power by the railway companies, the predominant one is improved power factor. It is, of course, true that railway loads have inherently better power factors than lighting and industrial power loads, and this to a certain extent militates against the railways when they allow their high power-factor loads to become a part of a general station load. The combined load naturally would have a lower power factor than the railway load alone if the peaks occurred at the same hour, and, speaking approximately, the lighting and railway daily peaks do synchronize. However, they do not necessarily reach their maximum annual peaks upon the same day, and here, as the author explains, quoting the figures of Samuel Insull, president of the Commonwealth Edison Company, the matter of "diversity" influences the result.

In a small plant, heavily equipped with spare units to insure continuity of service, a reduction of 8 per cent in the peak is really negligible, but when the total power supplied runs up to such amounts as 200,000 kw and the spares can be cut down to give a station capacity not 10 per cent in excess of that figure, the value of the reduction is apparent. In Chicago a decrease of 8 per cent in the annual peak has been secured by the combination of the railway loads with the lighting loads of the Commonwealth Edison Company, and it means a saving of approximately the same portion of the fixed charges. The latter, as the author points out, are by far the greatest item in operating cost, when power is generated in such large quantities as to permit of machinery of the highest efficiency.

The advantages due to the large size of the stations permitted by central station power generation is very well shown in the description of the Northwest station in the convention section of this issue. This station is provided with a private railway about a mile long running between the plant and the nearest railroad. It is a facility which would be prohibitive in cost for any but the largest-sized plant, but in the case of the Northwest station the first cost becomes negligible when the amount of coal handled during the year is considered.

The unit arrangement of the Northwest station is in a way forced upon it because of the enormous size of the turbines. Each one of these 20,000-kw machines requires something in the vicinity of 10,000 boiler hp to supply it with steam, and on account of the small floor space occupied by the turbine it would be difficult to take advantage of this feature in case the boilers were arranged in one or two rows parallel with the turbine room. In consequence, it has been found desirable to arrange the boilers in rows at right angles to the center line of the turbine room, ten 560-hp boilers being installed in each row and connected direct to the turbine at the end. Incidentally, it will be noticed that these boilers will be operated under normal full load at a rate approximately 100 per cent in excess of the manufacturer's rating. The rows of boilers are, however, not definitely separated from each other, and in consequence the plant is not strictly of the unit design. An 8-in. header, which normally supplies the auxiliaries, is tied in to the main steam line from each row of ten boilers. This practically forms a loop between the two main headers, and while the valves on this cross-connection are so arranged that the two units can be absolutely separated if necessary, it is possible, and, in fact, often considered desirable, to run a few of the boilers on the one unit for supplying steam to the next one. The main boiler-feed headers are also cross-connected so that the feed pumps on each unit act as spares in case of emergency.

The details of the arrangement of the auxiliaries in this station is interesting because of the enormous size of the plant. A closed heater operating at atmospheric pressure has been installed in order to eliminate the possibility of oil in the boiler feed from the exhaust steam of the auxiliaries, the designers evidently preferring to use this arrangement rather than to trust to oil separaters with an open heater. Under the conditions existing in Chicago, where water from the lake may be obtained practically free from scale-forming material, the increased amount of make-up water required by the closed heater arrangement is not an objectionable feature. Turbine-driven centrifugal feed pumps and wet vacuum pumps show the desire of the designers to secure the advantages of low maintenance costs possessed by rotating elements. The dry vacuum pump is, however, reciprocating and is run by the extended piston of a Corliss engine which operates the huge slow-speed centrifugal circulating pumps, the air cylinder being set tandem to the steam cylinder of the Corliss engine. This appears to be the only slow-speed apparatus in the entire plant, except, of course, the direct-acting steam pumps used to supply oil at high pressure for the step bearings of the vertical turbine spindles. The electrical auxiliaries have been arranged with an equal degree of attention to maintenance and reliability under all conditions.

Two-Car Train Operation in Newark

An Account of the Preliminary Results Obtained with Multiple Units in Operation on the Lines of the Public Service Railway of New Jersey, Including a Description of the Control System Installed on the Cars

Operating conditions during the rush hours in the city of Newark are known to be exceedingly severe. In fact, the intersection of Broad and Market Streets in the business district is one of the most congested crossings in the country. Market Street at the present time is the one highway through which east-bound and west-bound cars pass through the business district, and during the evening rush the tracks on this street are now operated up to their maximum capacity. Since the service for all thoroughfares in Newark directly or indirectly feeding into this street is dependent upon its capacity, the necessity for some means of eliminating the congestion is evident.

EXPERIMENTAL TRAINS

A little over a year ago the Public Service Railway arranged two double-truck cars for multiple-unit operation with the object of determining the possibilities of the arrangement for accelerating traffic. The cars, which had 25-ft. bodies and prepayment platforms, were equipped with maximum traction trucks, each car having two 50-hp motors. These cars were described in the Electric Railway Journal for Oct. 7, 1911, pages 607 and 661. They were comparatively old and small and had practically been taken out of service in the congested portions of Newark because with their maximum traction trucks they were unable to accelerate rapidly enough to maintain their places in the schedules.

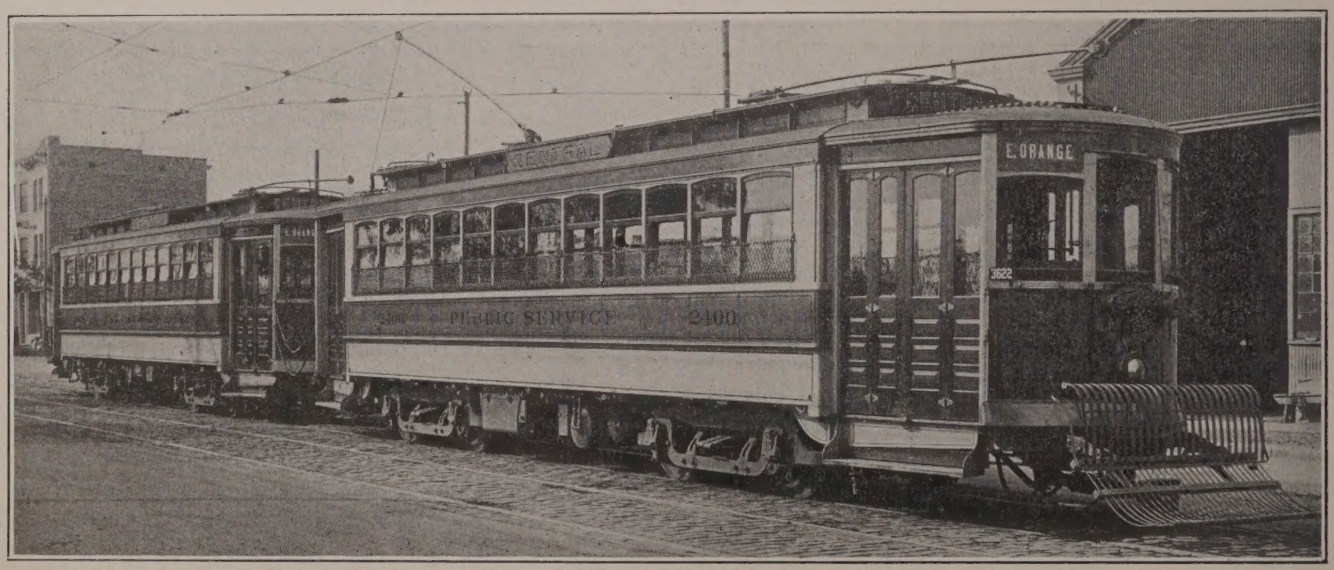
It was found, however, that when the two cars were operated as a train they could not only hold their place in line with the standard four-motor equipments, but could be operated on grades with a slippery rail which they were unable to climb when operated singly. The reason for this paradoxical condition is reported to be because the slipping which occurs with maximum traction trucks in localities such as Jersey City, where soft-coal dust tends to make the rail greasy, is eliminated for the rear car, the track having been burnished by the passage of the first car. During the latter part of the year 1911 this pair of cars was operated as a train between Jersey City and Bayonne, a distance of 9 miles. During the rush hours it was not uncommon for the train to carry a load of 200 passengers for the trip one way. The train easily made the same time as the standard four-motor equipment on the same run operated with single cars carrying approximately 100 passengers each.

MULTIPLE-UNIT CARS

The train proved exceedingly popular not only with the public, but with the operating officials as well, and ten additional trains were made up and operated regularly between Bayonne and Jersey City. These were so thoroughly satisfactory that the Public Service Railway has now equipped 100 new cars with couplers and multiple-unit control for train operation. Of these cars, seventy-six will be used in city service and twenty-four in semi-interurban service. All of them will be used in two-car trains during the rush hours on lines where the rush-hour traffic is approximately double that of the rest of the day. At present it is planned that the trains are not to be operated except during the rush hours.

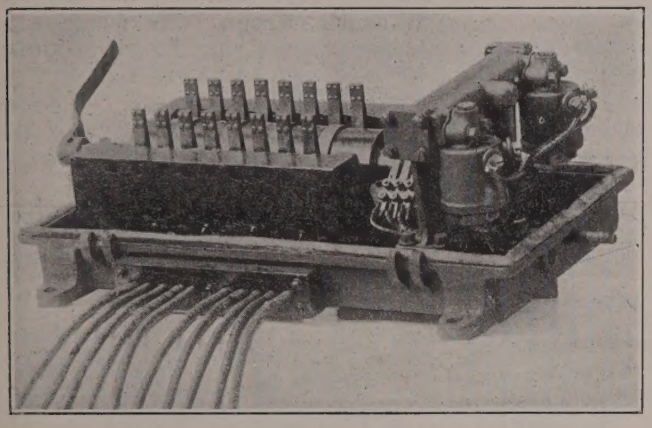
The new equipment will amount to approximately 10 per cent of the equipment now in use on the lines which center in the Market Street business district of Newark. There are not enough trains, in consequence, to make any radical change in operating results at present, but there is so much cumulative evidence of the advantages of multiple units that the Public Service Railway considers the matter settled at least as regards their operation on Market Street. The company is, however, planning to use the new cars to determine the best possible combination for operation. On Oct. 1 a complete test is to be begun to determine the relative merits of the following different arrangements: Two four-motor cars together, one four-motor and one two-motor car, two two-motor cars together and one four-motor car with a trailer. These four combinations will be thoroughly tested on different lines of heavy traffic in Newark. When the tests are complete the railway company will have in its possession the most thorough data upon the subject which could possibly be obtained. The tests, which will extend over long periods of time, are intended also to serve the purpose of getting passengers accustomed to two-car operation and in this way reduce the confusion due to the additional length of the unit.

Of the new cars, seventy-six are equipped with four 307-C

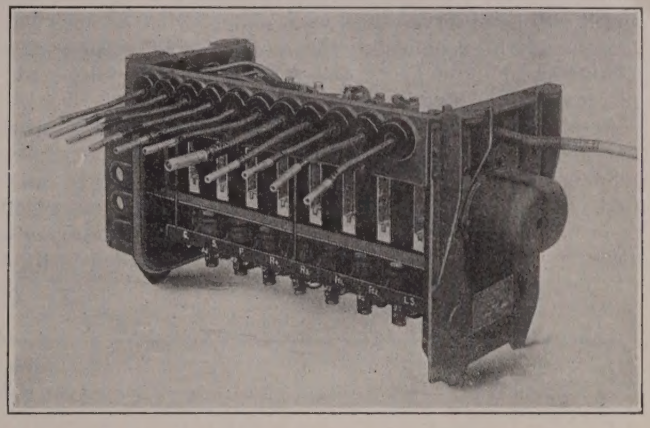


Newark Train Operation—View of Train Showing Receptacles on Front Dash for Electrical Connections

Westinghouse interpole motors of the box type rated at 40 hp to 50 hp, according to voltage, and geared 18:66; twelve of the cars have four 310-C Westinghouse interpole motors rated at 60 hp to 75 hp and geared 21:66. The remaining twelve cars are equipped with maximum traction trucks and only two motors per car, these being of the 310-C Westinghouse type and geared 18:69.



Newark Train Operation—Reverser for Motor Circuits Pneumatically Operated



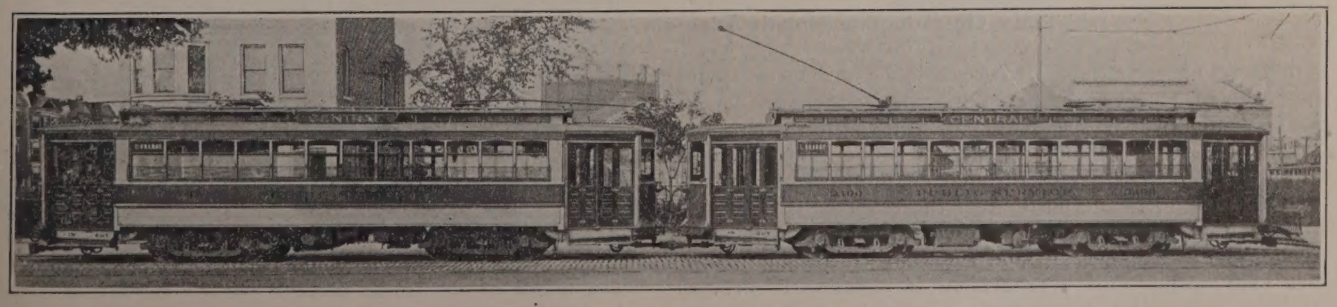
Newark Train Operation—Switch Group with Cover Plate Removed

CONTROL SYSTEM

All of the cars are equipped with Westinghouse HL control, in which, as is well known, the control circuits are made or broken by electro-pneumatic switches placed under the car, the operation of which is effected by energizing low energy circuits by means of a small controller on the platform. The Public Service Railway is the second large city railway to use this type of control extensively, the first company to adopt it being the Boston Elevated Railway. The latter company, however, does not regularly operate two-car trains on its surface lines, but uses the system for the purpose of saving room on the platform and eliminating the necessity for making or breaking large currents above the car floor.

The electro-pneumatic switches, arranged in a group under the car, are of the unit type and an illustration of one of these units is shown on page 605. The air valve, which is operated by a solenoid energized when the controller on the platform makes the proper connections, is located at the center of the lower portion of the unit. To the left of this air valve is the air cylinder which operates the switch. This cylinder works against a spring so that when the air is released contacts separate promptly and with great rapidity, thus shortening the arcing period. Air is supplied by a ½-in. pipe from the main reservoir of the brake system. The contacts are shown by the two L-shaped pieces near the center of the unit, the fingers from each contact being arcing horns which lengthen and weaken the arc as it is blown toward the right by the magnetic blow-out. The magnetic blow-out coils are placed on either side of each unit switch to break the arc formed when the contacts separate. These coils are arranged in series with the main motor circuit, which after passing through all of the coils is led back to the binding posts of the contact points as shown in the schematic diagram herewith. It has been found that the pressure between the two contacts plays a very important part in reducing the area of contact without raising the temperature, and the air cylinder operating the lower contact is designed to give a force of approximately 150 lb. The contacts are located in an arc chute composed of two pieces of non-inflammable material, such as asbestos board, which fit loosely into grooves provided for them. These loose pieces can be removed and replaced or turned around when burned and make inspection very easy. The contacts for the main current connections are shown at the top of the unit, the binding posts for the control wires to the solenoid coil of the pilot valve being shown at the side of the valve casing.

As all the units comprising a group are exactly the same they can be formed into a combination of any desired number. The complete group used for the Public Service Railway cars is shown in the illustration above, the sheet steel covers being removed to show the interior. On the right-hand end of the switch group frame is located the trip for the circuit breaker. This trip consists of a plunger which projects into the center of the outside one of the magnetic blow-out coils, through which, as above mentioned, the main current flows to the motors. When overload currents occur the plunger is drawn in against a spring, for it acts as a solenoid, and is locked in this position by a spring latch. On the plunger are mounted two contact disks which break the control circuits to the *R*-1 and *R*-2 unit switches, and by opening these switches the main motor circuit is broken independent of the controller. The latch which holds the plunger in the open position can be released, allowing the overload trip to spring into normal operating position by means of the reset switch, located over the vestibule windows and corresponding to the canopy switch of the ordinary control. The overload trip can also be released by hand by means of a cord attached to the latch and extending through the



Newark Train Operation—Side View of Two-Car Train

side of the casing. As the end of the plunger extends through a hole in the casing, the inspector can easily test the working of the trip.

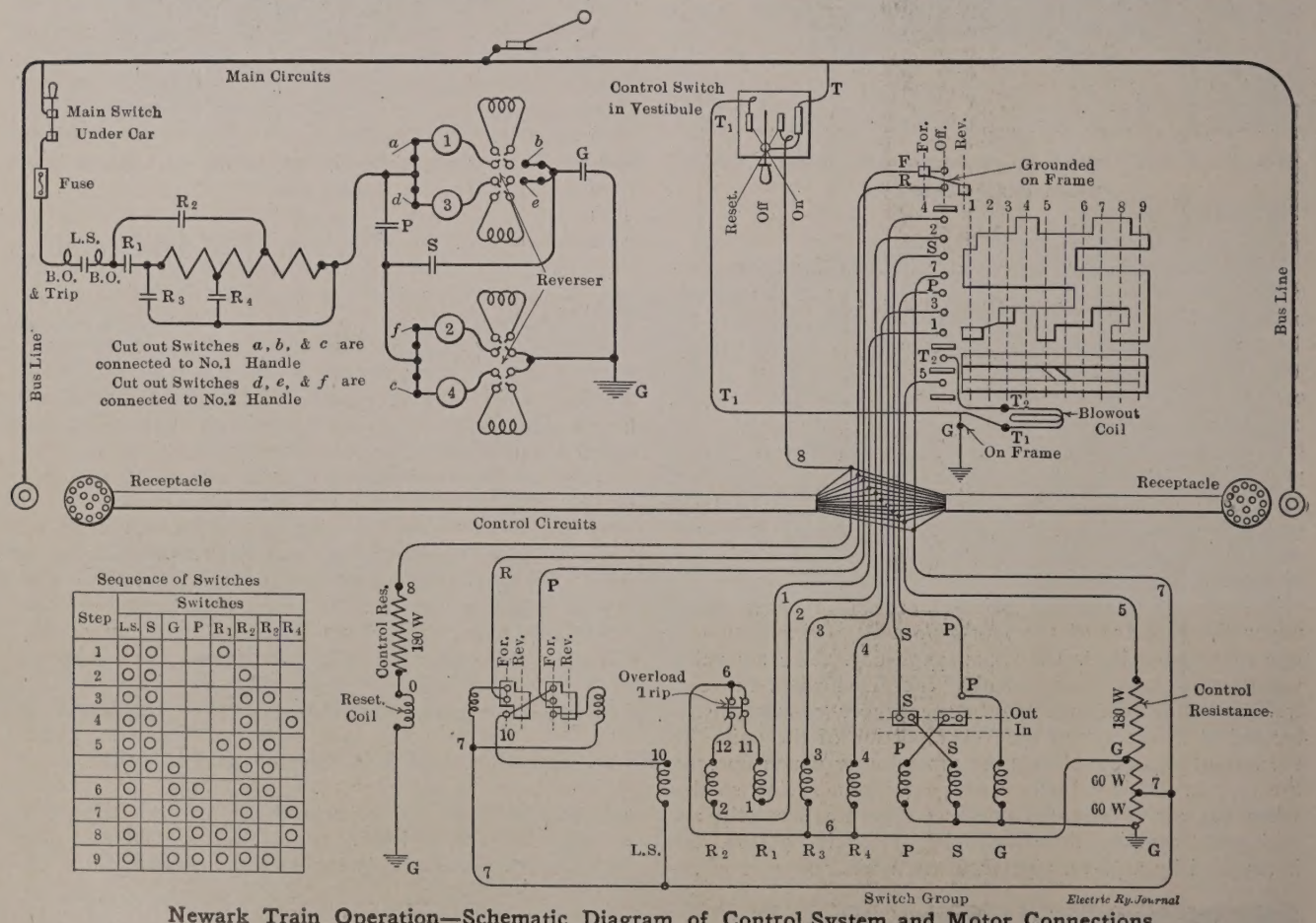
The electrical reset is effected by energizing a solenoid coil which opens the latch in just the same way as it is done by hand and allows the plunger to be pushed out by its spring. By reference to the schematic diagram the position of the switches marked *R*-1 and *R*-2 may be seen and it will be observed that when either switch is open current cannot be supplied to the motors. The arrangement eliminates, in consequence, the necessity for breaking heavy currents within sight of passengers.

Another illustration shows the reverser which is operated by electrically controlled pilot valves and pneumatic cylinders in the same way that the unit switches are operated. As shown in the illustration, the shaft upon which the rotating cylinder of the reverser is mounted extends through the casing to the left and is furnished with a handle. This permits the reverser to be thrown by hand in cases of emergency. There is also under the car a knife switch which opens the main line, this being used when work is being done on the car. The control circuit for the switch *LS* passes through an interlock on the reverser, and unless the position of the reverser is in agreement with the position of the reverse handle on the controller the control circuit, and consequently the main line, are kept open. This arrangement is installed to prevent the reverser being thrown while power is on the motors, for the reverser is operated on a control circuit necessarily completed only when the controller handle has been advanced at least to the first notch.

The master controller which energizes the different unit switches for controlling the motors is shown in the accompanying illustration. The small size of the controller is indicated by the view of the front platform of the car. The controller handle is interlocked in the usual way with the reversing handle so that the reverser cannot be thrown while the controller is in the off position. As before mentioned, the control currents are of very small magnitude, power for operating the pilot switches being obtained by taps on high resistance lines between the trolley and the ground. In consequence the currents which are made or broken by the controller contact are so small as to make practically no arc and to require practically no facilities for protecting against arcing damage. One master controller can, of course, control any number of cars by means of the bus control wires or train line carried along from end to end of each car. The use of train line receptacles and jumpers necessitates the use of only one trolley pole to supply current for the control circuits of any number of cars.

OPERATION

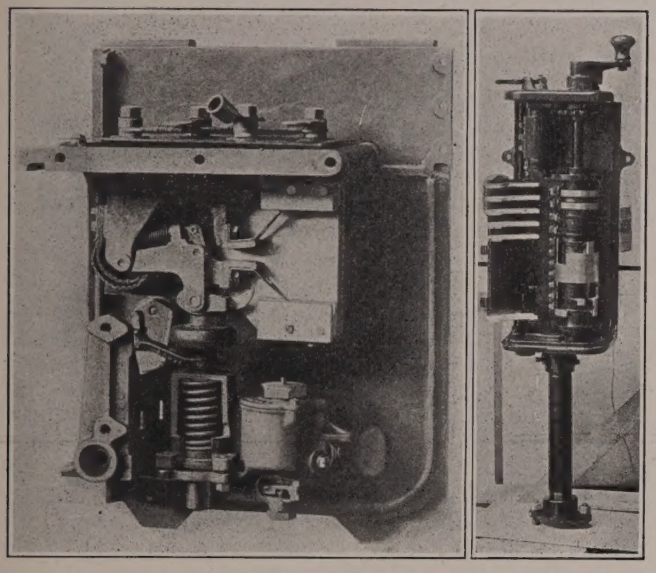
The new cars have not been in service a sufficient length of time to enable definite operating results to be obtained. Figures will, however, be given after the completion of the extended tests which are to begin on Oct. 1. However, R. E. Danforth, general manager, Public Service Railway, states that he is already thoroughly satisfied with train operation for service conditions existing during the rush hours in Newark. At the intersection of Broad and Market Streets, which is the point of greatest congestion, there is an average interval of forty seconds between blasts of the traffic officer's whistle permitting passage of cars in one direction. During this period it has been found that twenty-eight seconds is utilized for moving cars with single units in operation. The remaining twelve seconds is lost owing to spaces between the cars. By means of train operation it becomes possible to utilize a period of thirty-seven seconds, an increase of approximately 33 per cent. It is, in consequence, believed that multiple-unit operation will provide one-third greater capacity for the congested section of Market Street and to that



Newark Train Operation—Schematic Diagram of Control System and Motor Connections

extent will directly benefit traffic conditions all over the city during the evening rush.

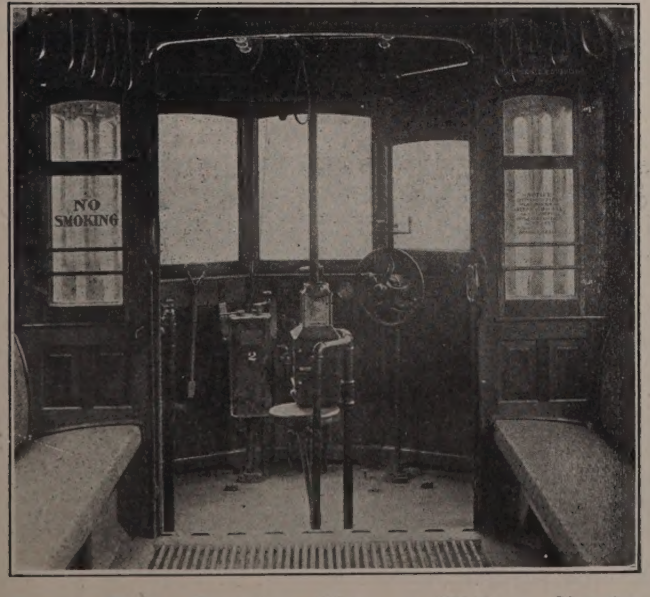
The trains are operated with the trolley pole of only one of the cars against the contact wire. A bus line is run through each car and is provided with a plug on each dashboard. No difficulty has been experienced in collecting the increased current required by the two cars through



Newark Train Operation—Unit Switch and Controller

one trolley wheel, but, of course, not enough mileage has yet been made to determine what effect the arrangement will have upon the life of the trolley wheel itself. Each car is furnished with an air compressor and is equipped with the GE type of straight-air emergency brake, which gives an emergency application in case the two cars should separate accidentally.

In its installation, this braking system requires two air connections between the cars, one line for the straight-



Newark Train Operation—View of Platform Showing Arrangement of Equipment

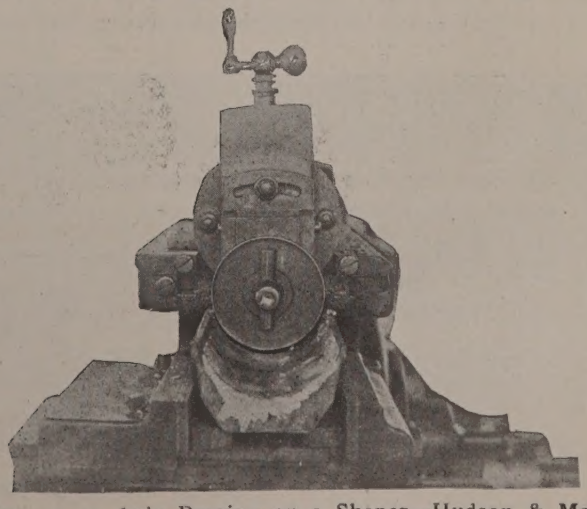
air service applications and the other to the emergency reservoir on each car. These two connections are made automatically when the cars are coupled by means of the Tomlinson automatic coupler in which the air pipes are brought through the face of the coupler and provided with the customary rubber gaskets. The couplers are held exactly in line by means of lugs which fit into corresponding recesses.

Fifty of the new cars were built by the Cincinnati Car Company, the remainder being built in the railway company's shops at Newark. They are arranged with all longitudinal seats and have 32-ft. bodies and 7-ft. platforms, the latter being arranged in accordance with the standard Public Service Railway Company's pay-as-you-enter design. Two of the cars are arranged with field control and are being tested with a view to determining the saving thus effected.

As shown by the accompanying views of the two-car trains, all electrical connections are made by line jumpers and plugs on the dashboard just below the windows. The receptacle at the left of the trolley retriever, as shown in the front view of the train, is for the signals between cars. It has four contacts, two for a circuit between the push buttons at the seats of the rear car for signaling for the motorman to stop and two for the circuit used by the rear conductor to signal to the forward conductor in starting. The next receptacle is the twelve-point connection for the control circuits and the third receptacle is a single-point connection for the main line bus from the front trolley pole to the rear car. The latter connection is deeply recessed to prevent accidents from people touching the live contact point and all receptacle covers are held closed with strong springs. Jumper lines are taped together except for a short length at the ends where they are left separate, and they are handled as one line.

ADAPTING A SHAPER FOR PLANING JOURNAL BEARINGS

For some time the Hudson & Manhattan Railroad has adapted a shaper at its Jersey City shops for scraping out babbitted journal bearings, as shown in the accompanying illustration. The planing disks used consist of scrapped axle metal, which was stamped to shape by means of a steam hammer. The back of the disk is perfectly flat, but the front has its circumference raised slightly in order to obtain a cutting edge for the removal of the babbitt. The disks are made in two sizes, one of 5 in. diameter for the 5-in. x 9-in. motor-truck journal bearings and one of 4¼ in. diameter for the 4¼-in. x 8-in. trailer truck journal



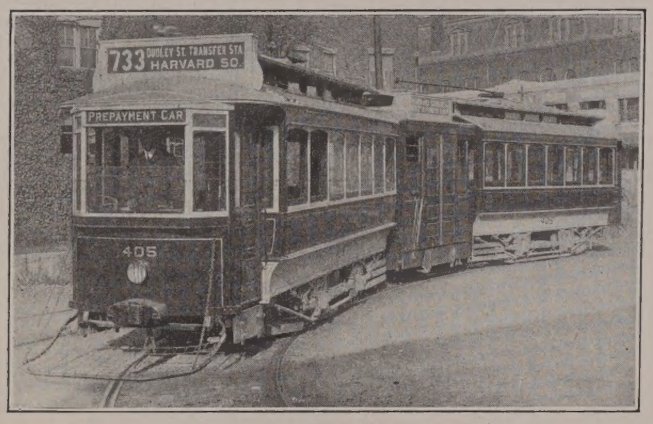
Scraping an Axle Bearing on a Shaper—Hudson & Manhattan Shops

bearings. The cost of the cutting disks is, of course, practically nothing. At the same time the work of scraping out the babbitt is greatly facilitated because the disks cut the entire width at once. In practice it has not been found necessary to run the shaper more than a dozen times to surface a bearing completely.

The Boston Articulated Car

Two Old Single-Truck Cars Which Are Flexibly Connected to a Common Central Vestibule to Secure a Large Capacity Unit for Operation Over Sharp Curves

A novel type of surface car has recently been placed in service by the Boston Elevated Railway Company on its Harvard Square-Dudley Street line, the equipment being specially designed for the safe and economical handling of traffic in the narrow and crooked streets of Boston. The car is of the articulated type, and in its assembly of existing rolling-stock units of small carrying capacity by means of a central or intermediate compartment it marks a noteworthy advance in the utilization of a large present investment in equipment no longer best suited to the requirements of the company's service. The company now owns 1175 25-ft. and 280 20-ft. closed car bodies, the former costing about $3,500 each and the latter $2,800 each, complete with trucks and motors and ready for service. In round numbers this rolling stock represents an outlay of about $5,000,000.



Boston Articulated Car—Taking a Curve

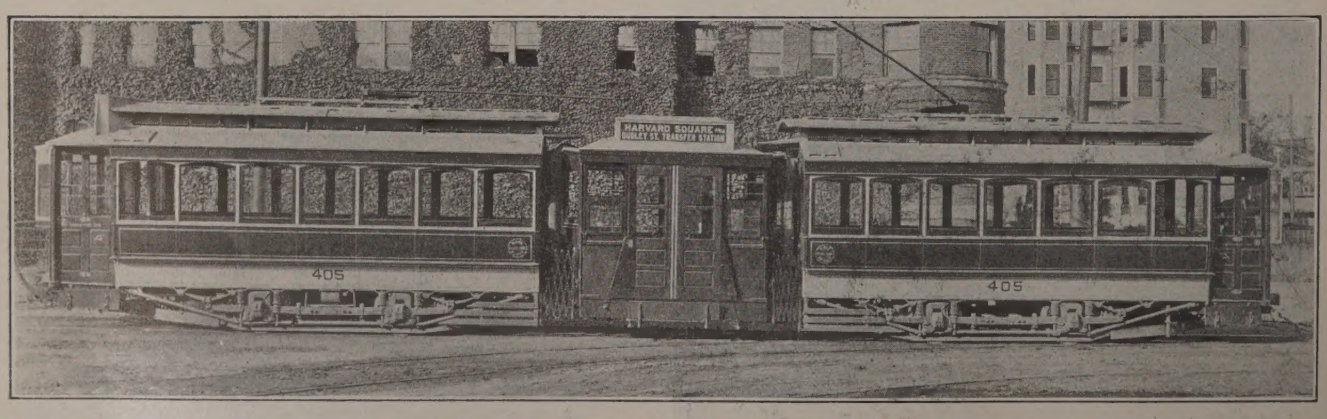
On account of the increased cost of operation and the growth of traffic the use of small cars has become undesirable for much of the Boston service, but the magnitude of the investment already made in rolling stock constitutes a serious obstacle to the profitable disposal of the older equipment. Many new and large cars of the semi-convertible type have been purchased by the company at a cost of about $8,000 each, but one of the chief transportation problems of the management has been the proper utilization of the smaller units and the possibility of their future application to the company's conditions. The new articulated car, designed with patent applications pending by John Lindall, superintendent of rolling stock and shops, represents the results of a long study of these conditions, and is an interesting addition to the developments of the year in car design.

DIVISIONS OF CAR

The car consists of three compartments, the two end sections being 20-ft. cars with one vestibule and platform removed from each. The intermediate compartment, shown at closer range in one of the views, affords a flexible connection between the two ends, and is used only for entrance and exit purposes, the seating space being entirely inclosed in the two end bodies. The use of the flexible connection enables the articulated unit to traverse any curve which either of the 20-ft. cars could negotiate alone, and no difficulty is experienced in operating the car upon curves of even 35-ft. or 40-ft. radius. A view on this page shows the car upon a curve outside the Bennett Street carhouse in Cambridge, and the drawing on page 607 is a plan of the car, with an elevation included. On a 35-ft. radius curve the maximum overhang is 2 ft. 9 in., which does not exceed the overhang clearance of the shortest cars used by the company. Another feature of great importance in connection with the Boston conditions is the distribution of the weight of the car on the track, which permits it to be safely operated over bridges designed for light cars. The cost of strengthening bridges and widening the spacing of tracks to accommodate large semi-convertible cars is a serious matter at Boston and has hitherto precluded the use of cars of the necessary capacity for economical service on many important lines.

FEATURES OF MIDDLE COMPARTMENT

The car is 62 ft. 10¼ in. long over bumpers, the middle compartment being 12 ft. 10 in. in length. The latter is pivoted to the end compartments in such a manner as to provide at all times a safe and easy passage between the compartments. The car is carried on Brill No. 21-E trucks under the end compartments, the distance between truck centers being 32 ft. 10¾ in. The absence of a truck under the center compartment enables the latter to be carried closer to the street, permitting a low entrance step 14 in. above the rail. As at present designed the car has folding steps at all doors, those of the center compartment being operated by compressed air, but if the experiment is successful it is the intention in future designs to lower the center compartment so that there will be but one step from the street into the middle section of the car, as in the stepless cars now used in New York. At present a second 13-in. step is required into the center compartment, and from



Boston Articulated Car—Side View Showing Joint Vestibule

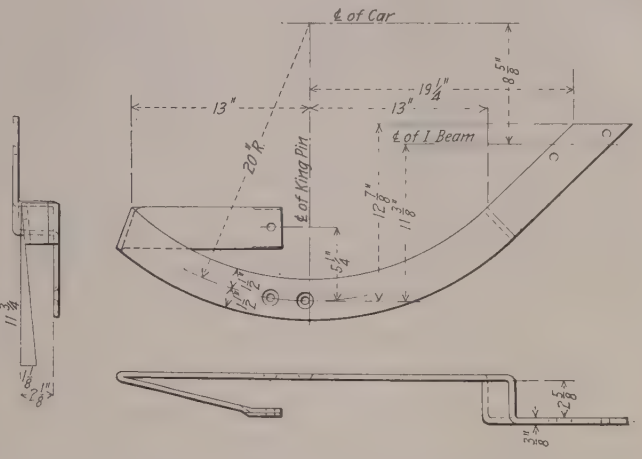
the latter a 5-in. step over a sill leading into each end compartment is required. In the next car designed it is planned to place the air cylinders in the roof of the center compartment.

PREPAYMENT OPERATION

The center compartment provides all the valuable features of the center-entrance type of car and enables the prepayment feature to be utilized to advantage. The conductor is stationed near the middle of the center compartment and immediately opposite the doors. Passengers cannot enter or leave while the car is in motion. Both doors and steps are pneumatically operated, and each door is 3 ft. 8 in. wide. The car is equipped with a Johnson fare box placed in the center compartment so as to divide the entering passengers into two groups, one moving easily to each end compartment. Railings of 1-in. pipe are installed to form aisles past the fare box, and a post of similar pipe is located on each side of the center compartment at the middle of the entrance to take the place of the usual grab-handles. A transfer register is mounted on a bracket crossing the center compartment, and chains are provided at the sides of the latter to prevent an inrush of passengers past the doors without payment of fares at times of heavy travel. In ordinary operation these chains are dropped and passengers naturally pass by the fare box before they enter the end compartments. Passengers leave by the front end or by the middle compartment doors, and at terminals where platform attendance is available the rear door is unlocked for exit purposes. If desired, a third man can be placed upon the rear platform in times of extraordinary travel, but this is not regularly done. The folding steps at both ends are operated by hand levers in connection with the control of the doors. The end compartments are provided with longitudinal seats, and the total comfortable seating capacity of the car is fifty-two, or the same number of seats provided by the company's large semi-convertible prepayment cars. By articulating two 25-ft. cars the seating capacity of the resulting unit becomes sixty-eight.

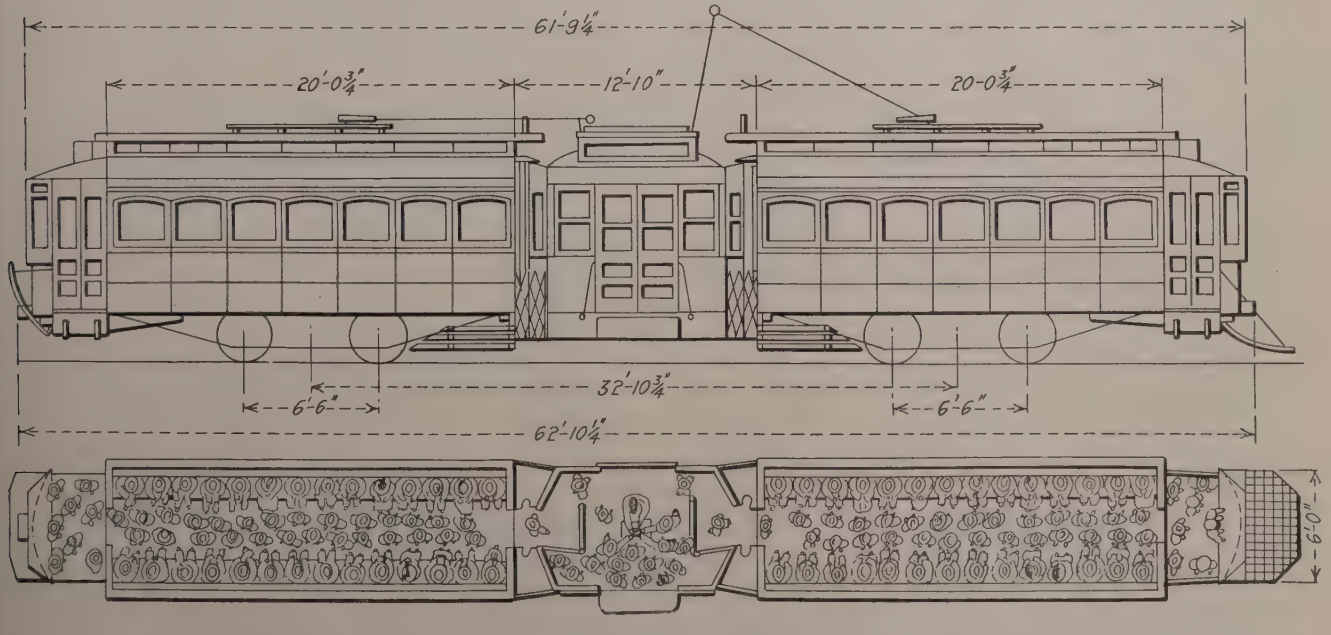
when the ventilator is closed. The trolley can be seen at all times and can quickly be replaced on both straight track and curves by the conductor. All that he has to do is to open the ventilator and manipulate the rope. This he can do without leaving the car as the ventilator is balanced.

The car is equipped with 30-in. cast-iron wheels, four Westinghouse 12-A motors, two K-28 controllers, Libbey



Boston Articulated Car—Side Bearing Plates, Detail of Junction Between Central Compartment and Car

fenders and straight-air brakes. Its weight complete is about 39,000 lb., or 750 lb. per seat, compared with 1020 lb. in the case of the prepayment semi-convertible car used by the company. The car weighs only about 1000 lb. more than the two 20-ft. cars weighed originally. With the removal of the vestibules of the latter there were also taken off two controllers, two sets of fenders, two bumpers, two brake staffs and two sets of snow scrapers. The use of the can-



Boston Articulated Car—Side Elevation and Bird's-Eye View of Passenger Handling and Distribution

EQUIPMENT FEATURES

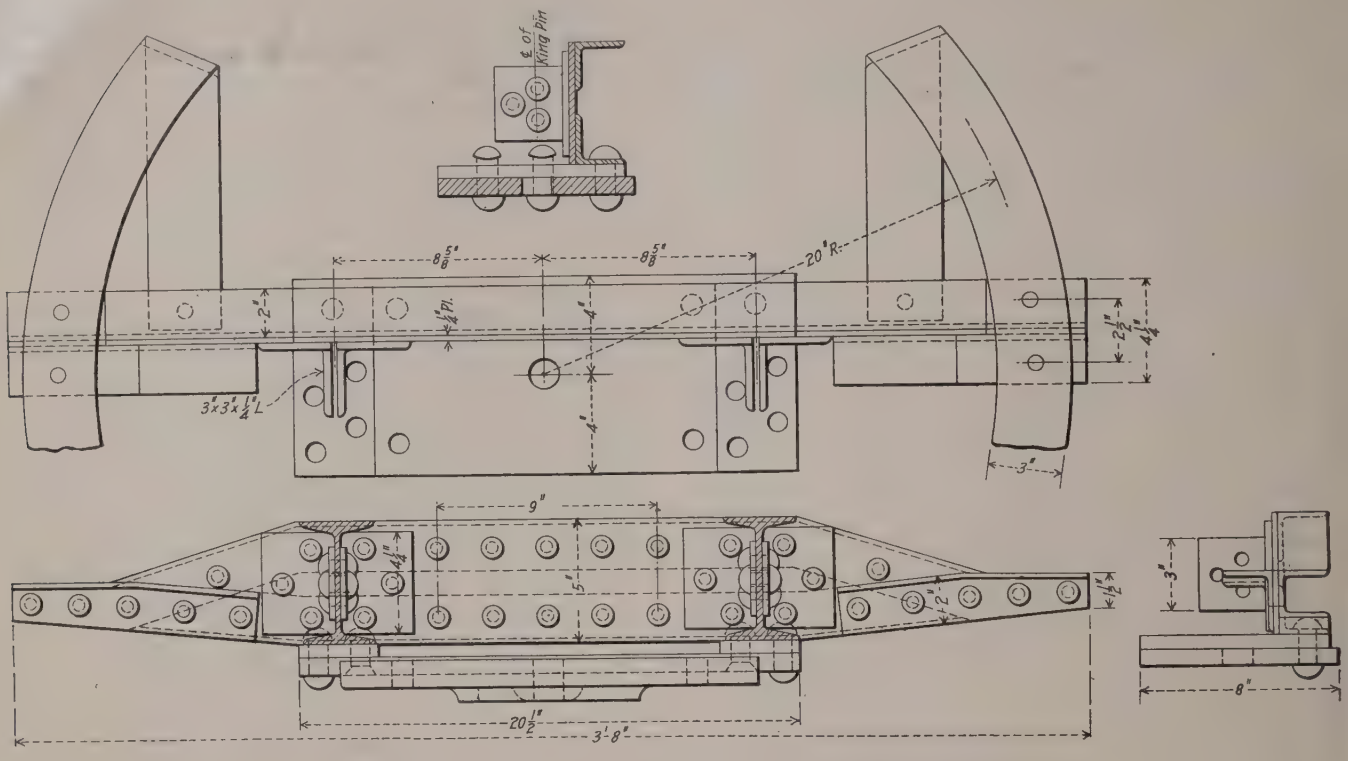
The center compartment contains another notable feature in connection with the handling of the trolleys. Each trolley rope is carried downward through a transverse slanting ventilator, 3 ft. 4 in. wide, to a catcher mounted on the pipe framing of the center section, the rope running through a metal bushing and being provided with a leather washer to prevent moisture from dripping into the compartment

tilever principle in the distribution of weights is an important factor in the easy riding of the car. Only four signs are required on the articulated car compared with eight where two 20-ft. or 25-ft. cars are used, resulting in a saving of about $100 per car. Air hose and cables are carried between the end and center compartments near the central axis of the unit, and the allowance of a small amount of slack takes care of the movement on curves. A

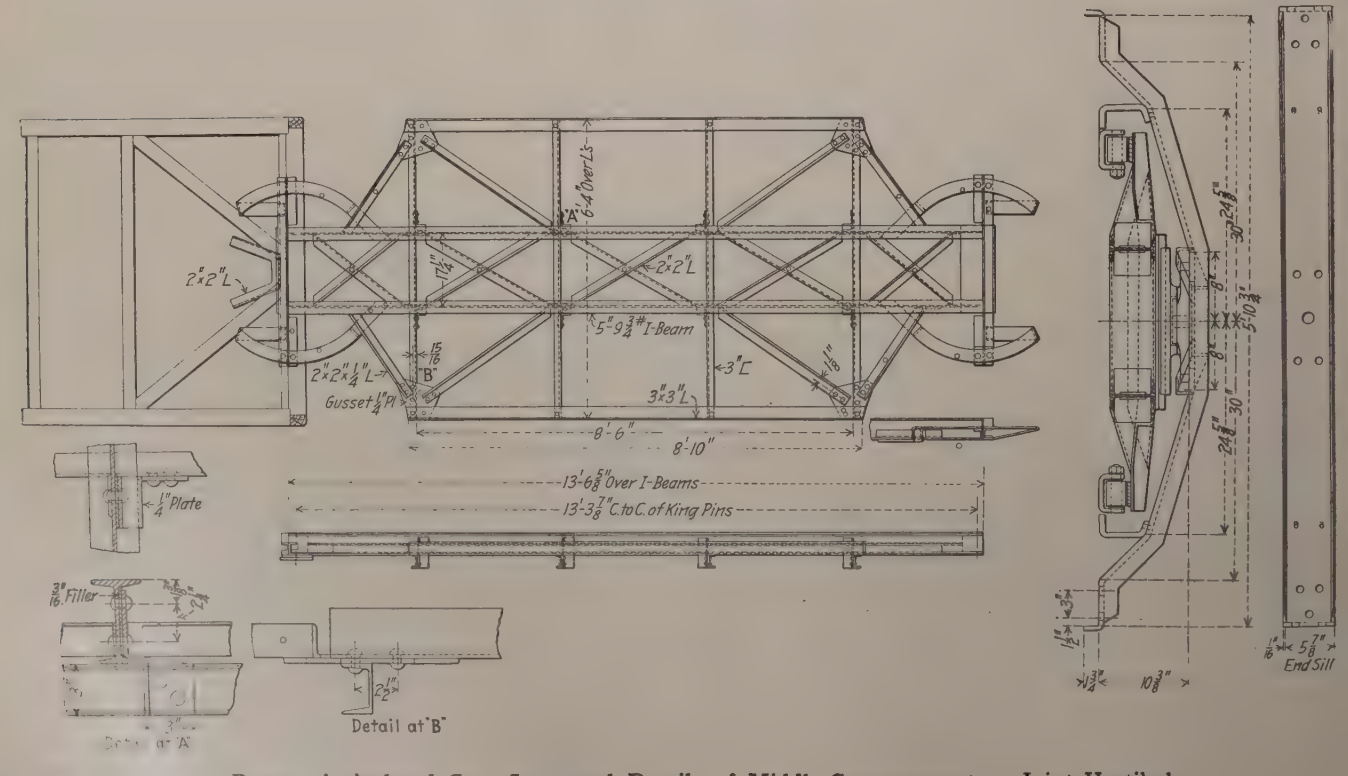
canvas closing piece connects each end of the center compartment with the end section adjacent, and the roof of the middle section of the car is provided with gutters draining

OPERATING ADVANTAGES OF ARTICULATION

The prepayment feature cannot conveniently be applied to the 20-ft. and 25-ft. sizes of car bodies without articula-



Boston Articulated Car—Details of Steel Plate Bolster

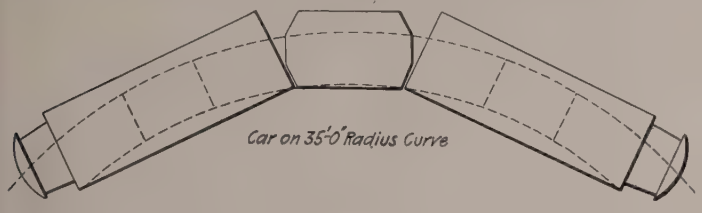


Boston Articulated Car—Structural Details of Middle Compartment or Joint Vestibule

to the corners only and away from the doors. The maximum speed of the car on the level is about 23 m.p.h., and the use of a motor on each axle gives an excellent acceleration.

tion. The use of this car, although it is not of the double-deck design, increases the traffic capacity of existing tracks, since it doubles the headway necessary to handle a given volume of travel, and by so doing enables a third unit to

be spaced between two others without shortening the original interval between cars. The reduction of the number of units required on the street to handle a given traffic also lessens the danger of collisions. Every such unit making a single round trip in the evening rush hour reduces the expense of platform labor by about $24 per week, since it



Boston Articulated Car—Position on a 35-Ft. Radius Curve

eliminates one extra crew who are now guaranteed a minimum of $12 a week apiece. The maximum saving possible in transportation wages by operating such a car is about $75 per week, assuming that the car is continuously in service throughout eighteen hours a day.

STRUCTURAL DETAILS

The structural details of the middle compartment are of particular interest from the mechanical point of view. As shown in a drawing on page 608, the compartment is carried on an underframe whose center sills consist of two 5-in. L-beams extending the full length of the section and connected at the ends to a built-up steel bolster shown on another drawing. The center sills are spaced 17¼-in. on centers, the underframing being 6 ft. 4 in. in over-all width and 13 ft. 3⅞ in. in length between king pins which pivot the bolsters to the framing of the end compartments, which is especially designed to hold the bolsters of the center compartment. The two center sills are braced by 2-in. x 2-in. angles placed diagonally as shown. The side sills of the center section consist of 3-in. x 3-in. x ¼-in. angles which are carried on four 3-in. channels extending across the car, the channels being attached by connection angles to the center I-beams. Each corner is braced by means of angles with gusset plate connections.

Boston Articulated Car—Entrance and Exit at Joint Vestibule

The bolsters each consist of a 5-in. x ¼-in. steel-plate cut to shape, as shown in the drawing on page 608 and reinforced by 2-in. x 2-in. x 3/16-in. angles. The bolsters are connected to the 5-in. I-beam center sills by 3-in. x 3-in. x ¼-in. angles. The entire weight of the center section is carried on 6-in. channels so formed as to allow the car to swivel on curves. The channels are braced by two 3-in. x 3-in. angles in each case, these extending backward diagonally and being bolted to the side sills of the 20-ft. cars. A radial side bearing, shown on page 607, is attached at each end of the bolsters of the center section, roller side bearings being located on the under side of the end sills on the 20-ft. cars. Standard car center plates and king pins are used at the pivotal points between the center compartment and the end sections. The upper center plate is bolted to the bolster of the center section, the lower center plate being bolted to the 6-in. channed carrier iron. Pantograph gates are used between compartments to prevent persons from getting in between the sections when the car is not in motion. The windows are all arranged to drop, and the roof of the center section is of the monitor type, carried mainly on two 1¼-in. x 1¼-in. angles extending across the car from plate to plate. The car was built at the Bartlett Street shops of the company and has attracted much favorable comment from the public.

CONVENTION ENTERTAINMENTS

A very attractive program of convention entertainments has been arranged for next week. The entertainment will begin on Monday night, Oct. 7, with the annual reception to the officers of the American Electric Railway Association and its affiliated associations. This reception will be held in the Gold Room of the Congress Hotel at 9 o'clock in the evening. Music will be furnished by Benson's orchestra. The reception will be followed by informal dancing, and light refreshments will be served throughout the evening. All of the officers of the American Electric Railway Association and of the American Electric Railway Manufacturers' Association will be in the receiving line.

On Tuesday afternoon there will be an entertainment for the ladies at the Blackstone Hotel in the ballroom. This will be in the nature of a recital and vaudeville performance by eminent artists.

Tuesday evening a card party has been planned to be held at the Congress Hotel in the Gold Room, at which both bridge and euchre will be played. It is hoped that there will be a large attendance at this party, as exceptionally handsome prizes have been provided for both games for both ladies and gentlemen; that is to say, there are four groups of prizes.

On Wednesday afternoon an automobile ride will be provided for the ladies. They will start from the Blackstone Hotel at three o'clock, and after passing through the park systems a four-o'clock tea will be served to the members of the party at the South Shore Club on the shores of Lake Michigan.

On Thursday evening the annual grand ball will take place at the Congress Hotel in the Gold Room. The music will be by Benson's orchestra and a buffet luncheon will be served.

One feature of the entertainment this year is that there are no events in the daytime for the gentlemen. This arrangement was made on request, so that there is nothing to take the men away from the exhibits or meetings. This fact should be appreciated by all.

A movement is on foot to erect a memorial in Westminster Abbey in memory of Lord Kelvin. The committee which has been formed to carry out the plan consists of members from a number of British engineering associations and from five American associations, namely, the society of civil engineers and mechanical engineers, the institutes of electrical engineers and mining engineers and the Society of Naval Architects and Marine Engineers.

Central Station Power for Electric Railways in Chicago

A Discussion of the Causes Underlying the Extended Use of Purchased Power by the Electric Railways in the City of Chicago as Described in the Convention Section of This Issue

BY HENRY H. NORRIS, PROFESSOR OF ELECTRICAL ENGINEERING CORNELL UNIVERSITY

In small cities it is not uncommon for the power for electric lighting and for railway purposes to be generated in the same power plant, but this does not often occur in large cities. During the coming convention of the American Electric Railway Association the members in attendance will ride in cars operated by energy purchased from the electric lighting company.

POWER CONDITIONS IN CHICAGO

In Chicago the central station, as a wholesale electrical energy factory, has been developed to a higher degree than elsewhere. This has been due to the persistent advocacy of the central station idea by the Commonwealth Edison Company and, what is still more important, to the boldness of this company in planning and constructing power plants on such a large scale and of such advanced design that energy can be generated by them more cheaply than by any possible competitor. The officers of the company frankly state their belief that the generation of electrical energy is a natural monopoly and that it is properly subject to rate regulation by commission. Further, they declare that, with competition eliminated, they would agree to the utmost publicity regarding the management of the property, including statements of receipts, expenditures and profits, the last of which are probably smaller than the general public supposes. The company has convinced the railway managements that it is cheaper, for the present at least, to buy energy than to generate it and the railway power plants are, therefore, being gradually shut down.

The rehabilitation which the Chicago surface railways have recently undergone made the time propitious for consideration of the central station proposition. The old power plants were largely obsolete and new ones were soon to be required. The amount of capital necessary for track, line and substation equipment was so great that the proposal of the lighting company to furnish energy as cheaply as it could be generated was well received. The contracts were so drawn that only a reasonable guarantee of demand was required by the lighting company and the railway companies could plan for future power plants if such were determined at any time to be more economical. After rehabilitation there would be opportunity to study the matter in detail, and by waiting at least a few years the railway companies would have the benefit of improvements in power generating apparatus which might be made in the meantime. It is even possible that practice in this line may become standardized.

CENTRAL STATION POWER USERS

That the railway companies of Chicago were right in their decision to use central station power is shown by the recent decision of the Third Avenue Railway Company of New York City to purchase energy from the New York Edison Company, the contract going into effect at about the present time. In this case the railway company possesses a first-class, modern power plant, entirely constructed within the past ten years, and representing the best practice of its time. It is a three-phase, 25-cycle, 6600-volt alternating-current plant. It is probably generating electrical energy as cheaply as any station of its size (28,000 kw) in the country. Yet it has been found economical to lease this plant to the lighting company and to buy energy, because the lighting company can operate the plant more economically as a component part of a large system than it can be operated independently. The railway company secures at the same time the reserve capacity of the very large plants of the lighting company. Under the new arrangement the load factor of the station will be improved by the addition of an industrial power load and also by the assistance rendered by other stations at the times of peak load.

The latest addition to the short list of companies buying Edison energy for electric railway purposes is the Philadelphia Rapid Transit Company. A few weeks ago the announcement was made that within about a year the company would be drawing 26,200 kw from the stations of the Philadelphia Electric Company. T. E. Mitten, president of the railway company, was formerly president of the Chicago City Railway Company and under his management all of the power plants of the latter company were shut down. He is evidently firmly convinced of the economy and reliability to be obtained by purchasing at least part of the energy required for operating his roads. In Philadelphia the lighting company will supply both high-tension, untransformed a.c. power and low-tension d.c. power.

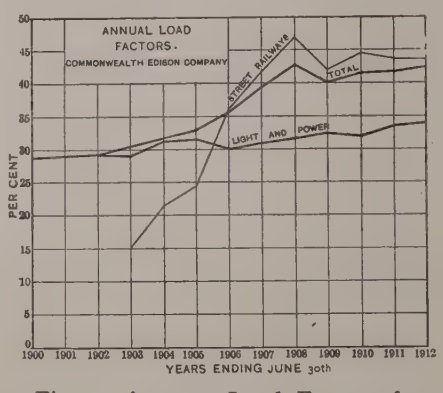


Fig. 1—Average Load Factors for Different Services

Other evidence along the same line is contained in the statements made by B. F. Wood, electrical engineer of the Pennsylvania Railroad Company, in the discussion of this subject at the April A. I. E. E. meeting in New York. Mr. Wood declared that if electrical energy could have been purchased as cheaply in New York as in Chicago his company could have saved the $4,000,000 invested in the New York terminal power plant and could have invested this in other electrical equipment, including locomotives, so as to earn 6 per cent interest.

ENGINEERING CONSIDERATIONS

In a recent paper* presented to the American Institute of Electrical Engineers by Samuel Insull, president of the Commonwealth Edison Company, the writer explains how it is possible to generate energy as cheaply as that company succeeds in doing. The chief engineering elements in the low cost are (1) high load factor, (2) reasonably large diversity factor, and (3) the use of large generating units. To these should be added good management, for without this the savings due to the others might easily be dissipated.

Improvement in the load factor is naturally the slogan of power plant management. Much of the activity in elec-

*See Proceedings A. I. E. E., July, 1912, p. 1473.

tric heating, refrigeration, ventilation, sign lighting, vacuum cleaning, etc., can be traced to the desire of central station managers to develop "off-peak" load. Specially low prices for energy are offered for off-peak business because it can be carried with little addition to the operating expense and no addition to the overhead charges. The power plant must be designed on the basis of peak load and this settles largely the cost of operating the plant regardless of the average load.

That the Commonwealth Edison Company has been successful in filling in the depressions of the load curve by the policy of supplying cheap energy is evident from the diagrams given with Mr. Insull's paper. These show that before the present policy was established the load curve of the Commonwealth Edison Company was similar to that of other companies of the same magnitude. The figures show recent load curves of the New York and Boston Edison companies for days of maximum load as compared with those of the Commonwealth Edison Company for similar days ten years back as well as last winter. The obvious conclusion is that a large lighting company normally has a load factor between 40 and 45 per cent, which can be increased 20 per cent by persistent effort. There appears to be no reason why a company in any other city similarly situated cannot do what has been done in Chicago in this direction.

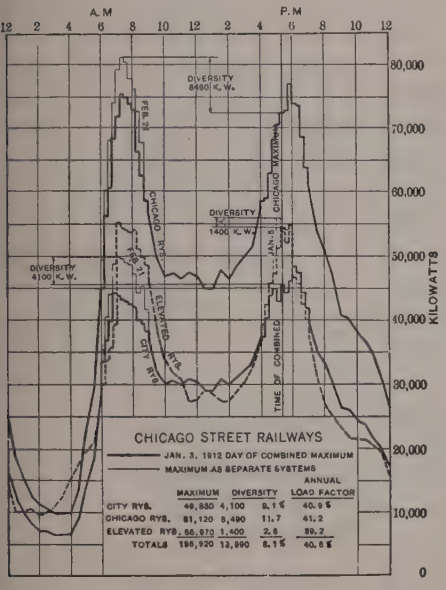


Fig. 2—Diversity Obtained with Railway Load When Included with Lighting and Industrial Loads

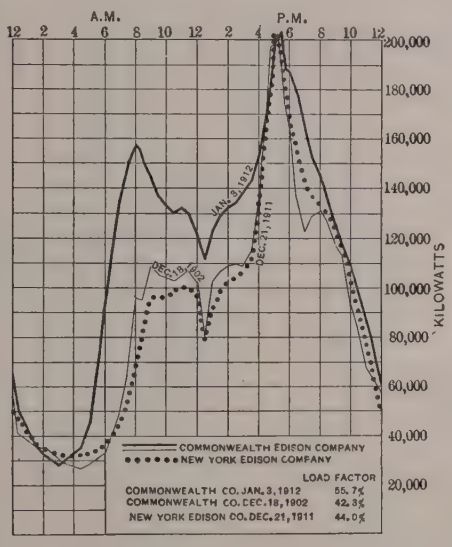


Fig. 3—Maximum Load Diagram at New York Prorated with Chicago Load for Comparison

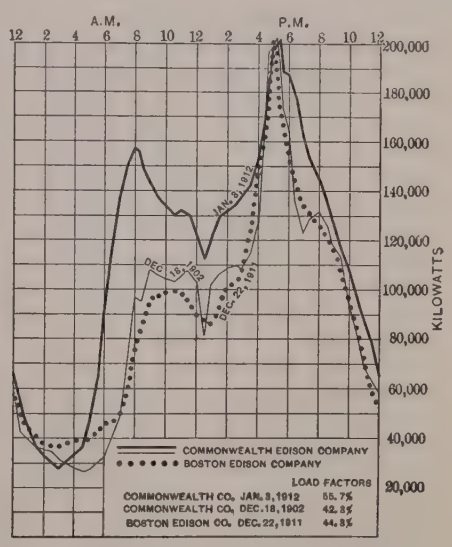


Fig. 4—Maximum Load Diagram at Boston Prorated with Chicago Load for Comparison

ADVANTAGE OF IMPROVED LOAD FACTOR

A considerable part of the success in Chicago has been due to the addition of railway load, which has inherently a better load factor than lighting load. This is shown in Fig. 1, where load factors for railway and lighting, as well as for these two combined, are plotted against time. Ten years ago the lighting and power load factor was about 29 per cent. This has been improved by the addition of industrial power, automobile battery charging, heating, sign lighting, etc., and it shows a tendency to steady improvement due to the increasing use of electrical power for purposes other than lighting. The railway load power factor showed considerable increase for a few years, but shows none at the present. At first, when the railway load was small, the factor was low because there were comparatively few cars drawing power at one time. As the railway business developed, the superposition of the power curves of several thousand cars made a composite curve that could not be improved much more, as the condition under which the cars operate is determined entirely by the demands of the public for accommodation. It might be suggested that storage batteries would be further assistance in reducing the peaks, but it is probable that storage batteries are as extensively in use at present as would be warranted in view of their great cost.

The contract under which electrical energy is sold to the railway companies is so drawn that there is every incentive for them to keep down their peaks. The "readiness-to-serve" charge is $1.25 per month per kw of maximum demand, and the energy charge is 0.4 cent per kw-hr. The maximum demand under this contract is calculated as follows: Three consecutive days are selected from each month, and from the morning and afternoon of each is selected the hour of heaviest load. The sum of the kw-hr. consumed during these six hours divided by six is the maximum demand for the month. The three consecutive days are selected so that the kw calculated as above is greater than that similarly calculated from the load line of any other three consecutive days. Under a contract like this the value of a properly manipulated storage battery can be readily measured by the control of peaks which it permits. Steam stations operated by the railway company have the same effect and may justify the expense of operating them, although this is doubtful.

ADVANTAGE OF DIVERSITY OF LOAD

An important element of good load factor is diversity of load. As has already been pointed out, the use of all kinds of electrical appliances has been fostered by lighting companies to secure diversity, or, in other words, loads which reach their maximum peaks at different times. Technically, the expression "diversity" has come to mean the difference in kw, or per cent, between the maximum value of any component of a combined load and the value of that component at the time of the maximum value of the combined load. Fig. 2, from Mr. Insull's paper, shows this graphically and also furnishes considerable information regarding the relative power consumption and load curve form of the three railways drawing power from the Edison system. On the afternoon of Jan. 3, at 5:20 o'clock, occurred the maximum Edison load, including railway, lighting and industrial power, for the year; in fact, the record load, over 200,000 kw. At this moment the three railways were using (from their own power plants and the Edison plants) power as follows: City Railways, 45,730 kw; Chicago Railways, 72,630 kw, and elevated railways, 54,570 kw, a total of 172,930 kw. The individual maximum loads for the year for these railways occurred as fol-

lows: City Railways, 7 a. m., Feb., 21, 49,830 kw; Chicago Railways, 7:20 a. m., Feb. 21, 81,120 kw, and elevated rails, 5:10 p. m., Jan. 5, 55,970 kw, a total of 186,920 kw, for which power plant capacity had to be supplied. In other words, the diversity in this case is 13,990 kw, or 8.1 per cent of 186,920 kw, the amount by which the power station capacity could be reduced by a joint use of generating stations.

ADVANTAGE OF LARGE UNITS

The third element of economy in central station power generation follows from the use of large units of up-to-date design. A small station cannot use very large units as these could not be kept economically loaded. But with the large unit goes a low cost per kw, both for machinery and for floor space, and a low water rate, with consequent saving in boiler and auxiliary costs and in fuel consumption. The statement has been made that a saving of a thousandth of a cent per kw-hr. would net the Edison company $4,500 per year. Hence the stimulus to obtain the best available prime movers for the company's plant. The history of the company for seventeen years past brings out the economic value of generating energy in large units. During that period the business has increased thirty-five fold. At the same time the price received per kw has decreased to one-fourth that received in 1896.

A central station can afford to replace units more rapidly than can a separate railway plant because it is constantly enlarging. The new units are naturally of the latest type, and as the price per kw of the large units is small, they can be purchased large enough to carry the load of obsolete machines, which can then be economically discarded. This process is much more difficult to carry out in comparatively small plants.

REASONS FOR LOW SELLING PRICE

W. L. Abbott, chief operating engineer of the Edison company, has estimated the division of cost of the generation and distribution of energy by his company as follows: Fixed charges, 50 per cent; general expense, 20 per cent, and operating expense, 30 per cent. The operating expense he divides into generating costs, 31.7 per cent, and distribution costs, 68.3 per cent, the generating costs being, therefore, 9.5 per cent of the total. The generating cost of 9.5 per cent is made up of operating pay-roll, 1.8 per cent; fuel, 6.3 per cent, and supplies and repairs, 1.4 per cent. Of the elements of the distribution costs, amounting to 20.5 per cent of the total, the bulk is made up of items incident to the lighting business, not more than one-fifth of it being chargeable to the transmission system. While it is impracticable, without access to detailed cost data, to estimate exactly the effect of the railway load upon the total expense, it is possible to see how this load can be carried without a proportionate addition to the whole expense. If, through perfect diversity, it were possible to carry the railway load without additional equipment except transmission lines, the only extra expense would be for fuel, which is but a small part of the total, and for fixed charges and maintenance of the transmission system, also a small part of the total. If the generating capacity must be increased, due to the railway load, it need not be increased proportionately, on account of diversity, but even if it were, the total fixed charges and general expenses would not be increased proportionately.

The distribution is also much smaller than it would be with numerous stations supplying the same territory. If two or more railways and a lighting company are distributing power in the same area, they must unnecessarily duplicate transmission lines and substations. A general radial system produces maximum efficiency of transmission with minimum fixed charges and the customer shares the benefit with the producer. It is in line with the principles of scientific management and hence must eventually prevail.

RELIABILITY OF POWER SUPPLY

Up to this point nothing has been said as to the most important factor in railway service. Cheap energy is good, reliable energy supply is better, and a combination of the two is best. In reliability central station energy excels, especially if two or more independent power plants are tied together, and to the substations, with several transmission lines. The reliability is still further increased by interconnection of substations both on the incoming and outgoing circuits. In Chicago the contracts are drawn so that practically perfect continuity of service is guaranteed. There are three new large power plants already available and these are built up on the unit system, each unit being virtually an independent power plant. Each customer, therefore, is as safe as if he had all of these plants operating for him alone.

OBJECTIONS TO CENTRALIZATION

The principal objections which have been made to the central station plan for all electricity supply are based on the fact that there is such a variety of requirements in different classes of service. Lighting requires one frequency, direct current railway work another and alternating current railway work a third. Some customers want high, others low, and some intermediate voltages. Some want three-phase alternating current, others single-phase and still others direct current. While these objections have weight it must be remembered that in all lines of electrical applications there is the tendency toward uniformity in power generation and distribution, with transformation in substations as required. The substation is reasonably efficient and economical and is necessary whether central station power is used for one purpose or many.

But how about the dangers incident to monopoly? These must be provided for by suitable commissions. It would seem, however, that there is less danger in a power monopoly than in some others. The consumer can always become a producer if he wishes to invest the necessary capital and if he is convinced that he can give himself better service than he can buy. In Chicago the railways can, and, if they were convinced of the economy of it, would not hesitate to, build their own power houses.

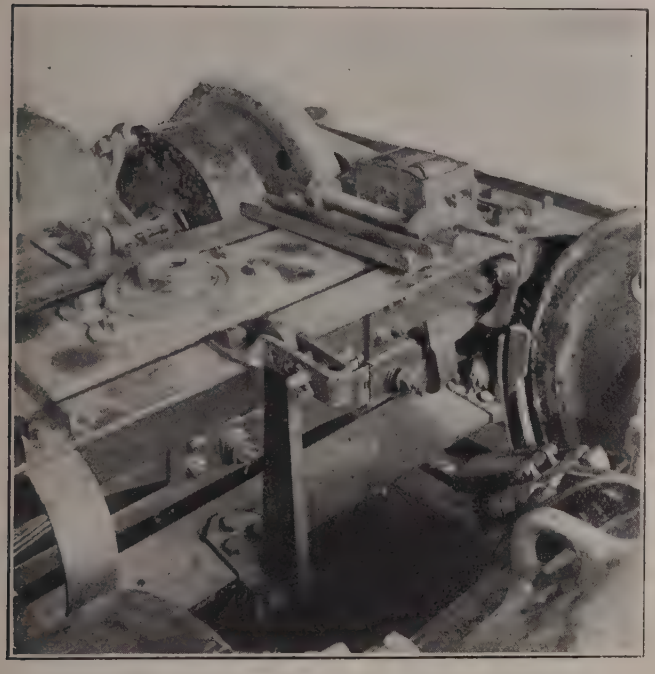
CONCLUSIONS

There is no inherent reason for the association of the transportation and power generation businesses other than a historic one, unless it be the desire for independence. When the horse was supplanted by the electric motor in traction service the tramway companies went into the electrical business as a matter of course. In fact, there was nothing else for them to do. The horse car was a development from the omnibus, which was largely a stable proposition. Each horse was a separate power plant and the power plant end of the business predominated. But the power plant was a simple one, requiring for its efficient maintenance only skilled hostlers, with the occasional services of the veterinarian. The new motive power, electricity, brought in a different class of labor and entirely different problems. As the traction business has developed, covering greater and greater areas, the power plant has gradually become a complicated affair, requiring for its operation the highest grade of technical skill. At the same time the selling of satisfactory transportation has also become a highly specialized business, entirely distinct from that of motive power. There are, therefore, only the same reasons for the generation of electrical energy by railways that there are for the production of raw materials by any manufacturer. For example, a manufacturer of wire might or might not make his own steel. If he did, the reasons for his doing so would probably be to insure his supply as needed and to produce it more cheaply than he could buy it. In general, however, he would buy his steel because, economically, it is easier for a specialist in steel manufacture to secure continuity of supply than for one whose main business is some other line, and he can also manufacture more cheaply because he does it on a larger scale.

New Truck Designed by Bay State Street Railway

Illustrated Description with Table of Material and Detailed Weights of a Truck Embodying Many Interesting and Novel Features

One hundred new trucks, locally known as the "BS-12" type, have recently been placed in service by the Bay State Street Railway, Boston, Mass., which operates about 1000 miles of track on the north and south of the New England metropolis. The trucks illustrate a number of departures from previous practice which are of special interest to operating officers and were built with particular regard to



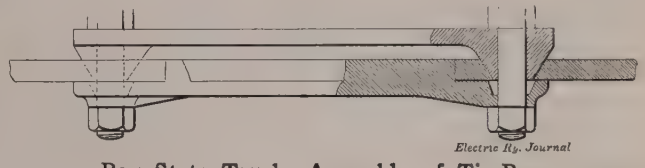
Bay State Truck—Brake Rigging, Bolster Spring Hanger and Damper with Release Spring Removed

the problem of securing economy in material and lightness of weight combined with ease of riding, accessibility of parts and the prevention of failures capable of causing derailment. The trucks are the product of a long research study of various existing types of trucks and comparative

Bay State Truck—View of Trucks Under Car

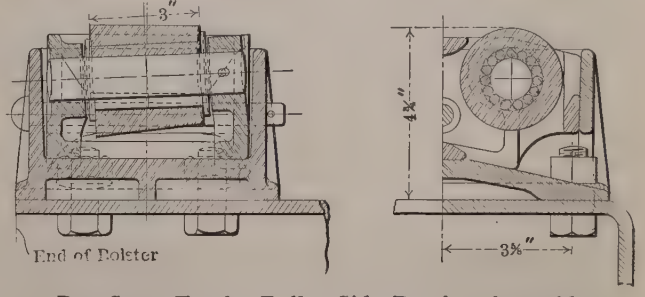
service conditions. They were designed by the superintendent of equipment Bay State Street Railway, and all detailed drawings were made under his personal direction. The manufacturer was the St. Louis Car Company. In building the trucks a negative was made of each detailed drawing of the Bay State company's group of BS-12 truck plans, elevations and sections; the manufacturer made prints of these negatives and thus worked direct in the shops from the railway company's details.

The Bay State-12 truck is of M. C. B. type, with outside-hung motors and inside-hung brakes, and is designed for city and suburban service, with a working load of from 15,000 lb. to 20,000 lb. per king pin. The trucks are in service on the company's own standard design, 1909 type,



Bay State Truck—Assembly of Tie-Bar

light-weight semi-convertible cars, described in detail in the Electric Railway Journal of April 2, 1910. The satisfactory service given by these cars led to a recent order of exact duplicates from the St. Louis company, and the accompanying halftone shows one of these mounted upon two BS-12 trucks, the car-body details being the same as those described in the above-mentioned issue, with the exceptions



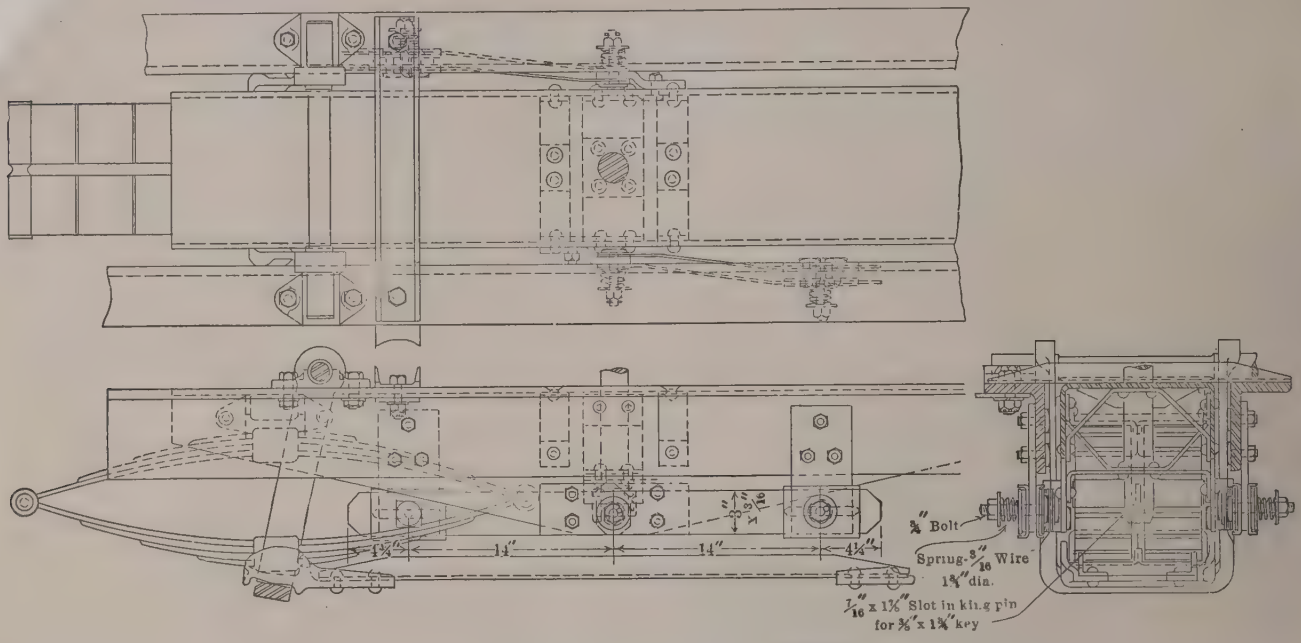
Bay State Truck—Roller Side Bearing Assembly

of the use of fenders, anti-climbers and bumper shields of the types illustrated. The present fender is of the railway company's own design and is of the hinged type. The new cars are each equipped with four GE-203 (40-hp) interpole motors, with K-35-Q control, having a separate contactor box under the car body, and with GE straight-air brakes and a CP-27 compressor.

Bay State Truck—Side and End View of Truck

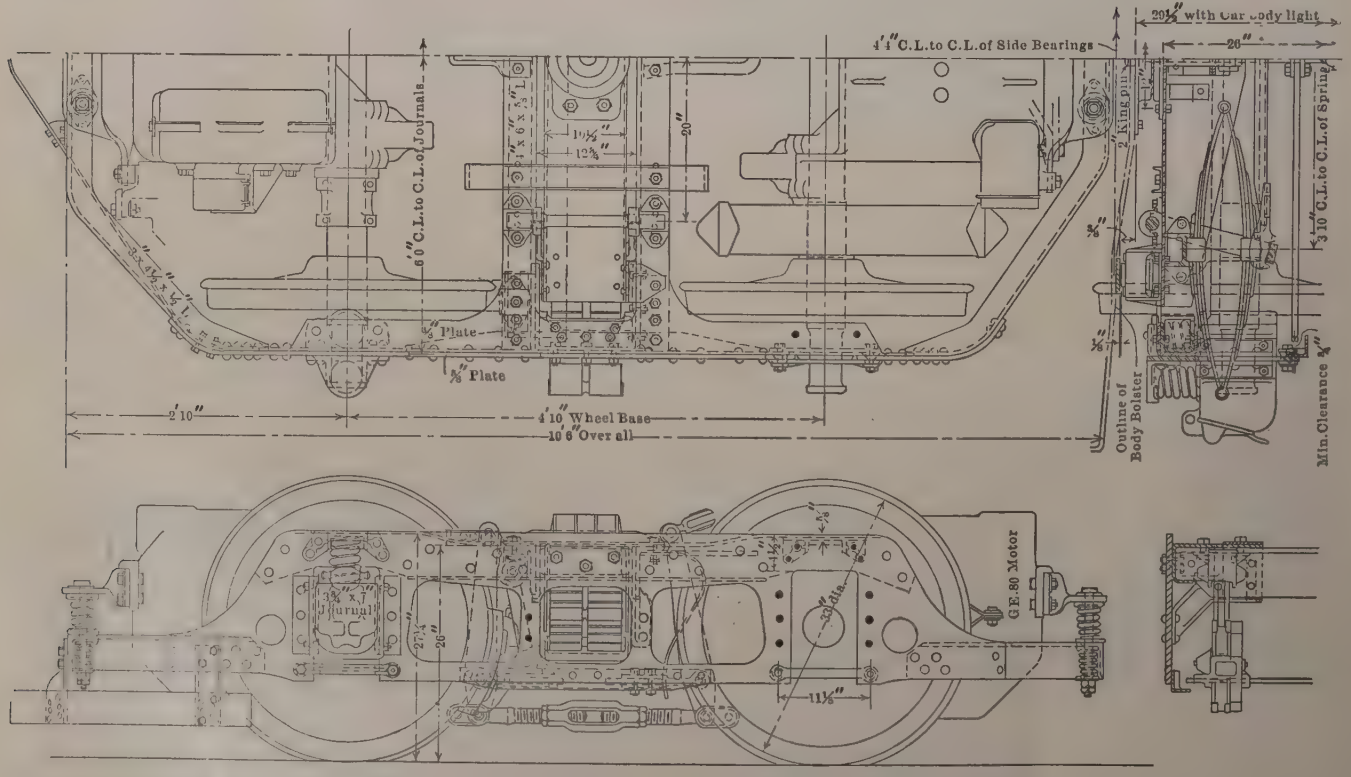
The new trucks are designed with a 4-ft. 10-in. wheelbase and are 10.5 ft. in over-all length, the width between the journal centers being 6 ft. Exclusive of journal boxes, wheels and axles the truck weighs approximately 2950 lb. The various frame parts, which are simple in design, are built with the standard commercial sizes of steel and iron. The frame is made up of boiler-plate side frames tied to the

transoms with pressed-steel gussets which act as reinforcements for the side frames. The side framing is formed of a single steel plate on each side, from which all surplus metal has been cut out, as shown in the lower cut on this page. Besides the pressed-steel gussets a square, machined journals were punched out the corners were bored out with a 1.5-in. drill to avoid any danger of nicking the material and thus predisposing the metal to later defects. At the journal gates the side frame is tied with double tie bars. The inside bar is provided with tapered lugs which fit into tapered



Bay State Truck—Bolster Assembly

steel casting is placed between and fastened to the transoms, gussets and side frame. This casting is machined on all sides and is extended downward in two lugs which are riveted to the side frame in line with the center of the holes in the frame and also into cup-shaped lugs on the outside bar. The frame is tied between the lugs of the two bars with bolts on which there is no shearing strain. An angle iron is riveted to the lower portion of the side frame



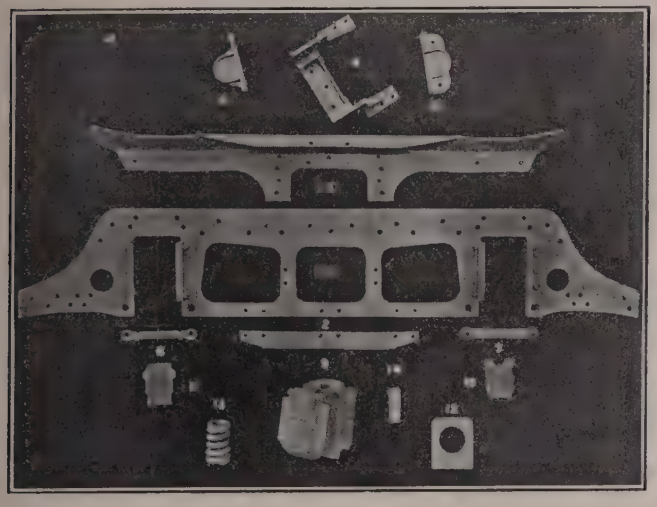
Bay State Truck—Half Top View, Elevations and Details

journals. This construction eliminates the possibility of tilting of the side frame and insures the trucks absolute squareness under all conditions. It also gives to the construction ample stability and strength laterally as well as vertically. When the openings in the side frames for the for the purpose of providing a safety guard for the brake-beams and bolster. The journal chafe irons are bolted to angle irons riveted to the gates. Countersunk bolts are used on the journal chafe irons, but are eliminated at all other points in the truck. In order to prevent the possibility

of fracture through crystallization of material near the journal openings, the gusset framing is carried out beyond the journal a distance of 6.5 in. at each end of the truck.

The end frames are made up of angle irons securely riveted to the side frames, a single piece being used in each case. On one side each end frame is narrowed sufficiently to permit a sand spout to be placed near the wheels without interfering with the swing of the truck.

The bolster is of the swing type, of the extended width of 10½ in., the material being pressed steel. It is braced inside the center with steel bands, one of which acts as a stop for

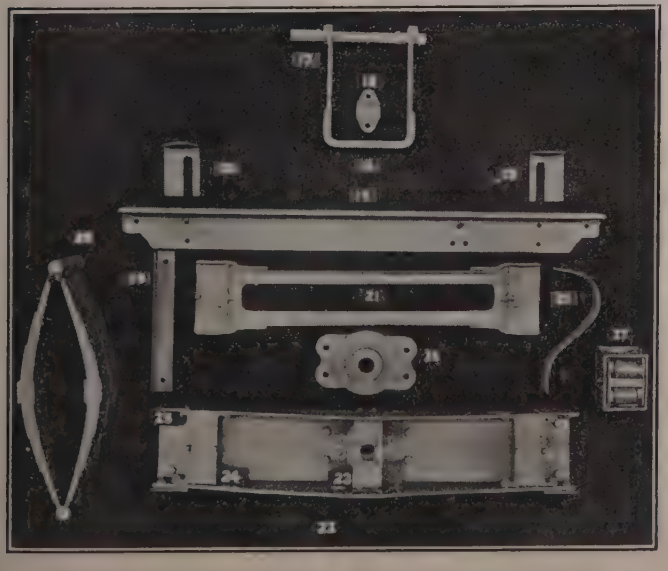


Bay State Truck—Parts 1 to 14

the king pin. The latter is provided with a standard key.

The bolsters are constructed wide in order to insure greater stability of the truck and at the same time to permit the use of full elliptic springs made of very wide material and extended in length, thus effecting a notable improvement in the riding qualities of the car.

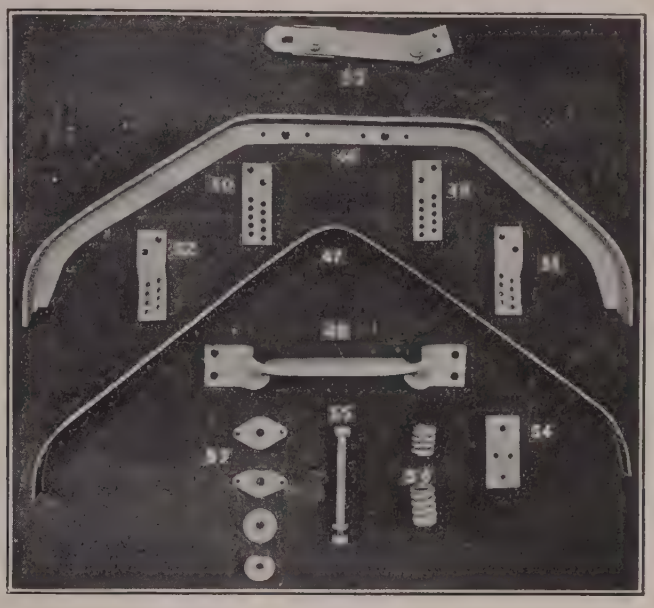
The spring-plank hanger is made in one piece and keyed to a shaft which is supported in brackets on the transoms,



Bay State Truck—Parts 15 to 30

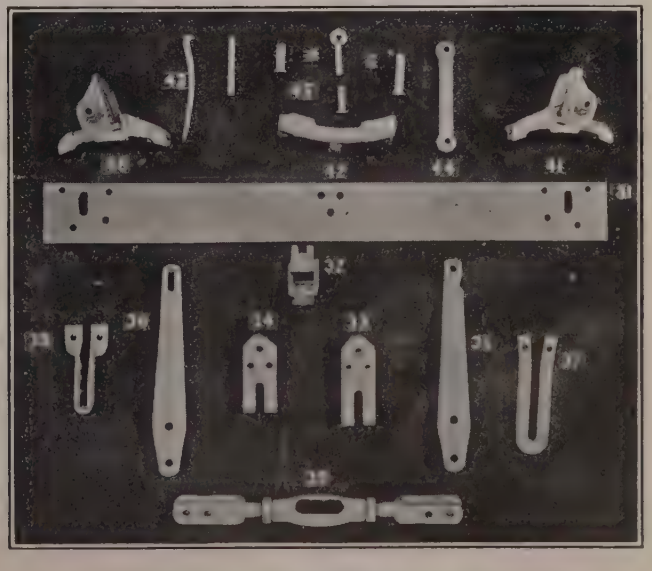
thus giving a greater wearing surface. Long hangers carried very low are used, and these are adjustable for side thrust, and an easy swing of the bolster may at all times be insured by moving the shaft brackets in or out on the transom. The vertical adjustment is obtained by dropping in a shim between the hanger and the spring plank. The spring plank is made of two light angle irons fastened with rivets to the spring seat castings. The bolster and spring plank are safeguarded by the brakebeams from coming in contact with the roadbed in the improbable event of the failure of the spring-plank hanger, and there is provided a further protection in the shape of the angle iron riveted to the side frame as previously described.

The bolster is equipped with check plates, one being installed on each side. Each consists of a long steel plate



Bay State Truck—Parts 46 to 57

of which one end is bolted to a bracket at the center of the bolster, the other end being provided with a long slot and being arranged to work between two friction plates attached to a bracket on the transom. The transoms are made of angle-irons and are bolted to the gussets and transom castings. The transoms are placed 12¾ in. apart, and this width in spacing, combined with the design of the transom casting and reinforcement gussets, is an important factor in the



Bay State Truck—Parts 31 to 45

strength and rigidity of the frame as completed. Two channel irons bolted to the transoms serve as bolster tie straps.

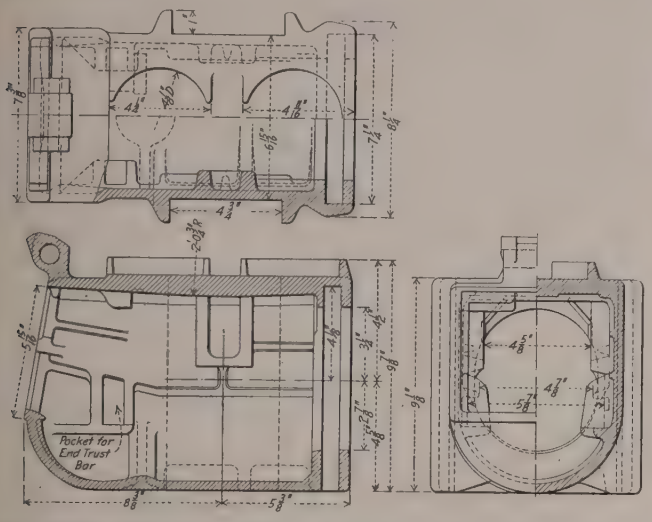
Ball center bearings are used, with double rollers of tool steel in the side bearings. The rollers in the latter are ⅜-in. in diameter and work on 1-in. steel spindles. All surplus material has been cut out of the design of the center bearings, and the side bearings are designed with cut corners to facilitate the automatic disposal of dirt. The ball center

bearings are of Symington make, and the roller side bearings and damper plate are similar in design to previous types built by the Standard Motor Truck Company. The motor suspension is supported on springs placed a comparatively short distance apart, enabling the use of a lighter motor suspension bar and a narrower end frame. The metal between the two lugs of the motor is bent over at right angles for the suspension spring seat, and this prevents the dropping of the motor even in case both suspension lugs break. The wheelguards are provided with multiple bolt holes for attachment to corresponding bars depending from the side framing, so that the company can easily meet the requirements of the Massachusetts Railroad Commission in regard to the height of wheelguards above the rail. The journal springs are helical and are placed one at each side of the side frame, which enables the use of a more sensitive spring and gives an easy riding truck. Journal boxes, wedges and bearings are of the standard M. C. B. type, but the top of the journal box has been curved on the inside to offset any difference in the two springs if any should occur. On the inside the journal boxes are fitted with pockets to receive in each case an end-thrust bar for the journal. This bar, 5¾ in. x ⅞ in. x 1⅞ in., which is illustrated in a drawing on page 617, is made of malleable iron and

Table of Weights and Material Bay State "12" Truck.

Drawing Number.	Piece Number.	Title.	Description.	Weight of Each Part, Pound.	Number Per Truck.	Weight Per Truck, Pound.
52675	1	Side frame plate	8 ft. 8 in. x 18 in.—⅝-in. steel plate	147	2	294
		Journal chafe iron	9½ in. x 4⅝-in. steel plate	6	8	48
		Journal chafe iron angle	2 in. x 2½ in. x ¼ in.—9½-in. angle iron	5⅜	16	86
52075	7	Side frame plate tie bar (inside)	Drop forging (interchangeable with brakeshoe hanger)	4¼	4	17
52075	8	Side frame plate tie bar (outside)	Cast steel	2⅝	4	10½
52675	3	Gusset plate	6 ft. 7⅞ in. x 16½ in.—⅜-in. steel plate	78	2	156
52555	46	End frame	3 in. x 4½ in. x 1½ in.—8-ft. angle iron	92	2	184
52555	15	Transom	4 in. x 6 in. x ⅝ in.—5-ft. 10⅜-in. angle iron	111	2	222
52016	4	Transom casting	Cast steel	49	2	98
						1115½
52825	9	Journal box	3¾ in. x 7 in.		4	356
52733	10	Wedges	M.C.B. standard, cast steel	5½	4	22
52733	11	Bearing	M.C.B. standard, composition, babbitt-lined	9½	4	38
52930	12	Dust guard	Hard wood, lined on both sides with leather	½	4	2
52920	14	End thrust bar	1⅞ in. x ⅞ in.—5¾-in. malleable iron, babbitt-lined	3	4	12
52075	13	Journal spring	4 in. x 6 in.—⅝ in. wire, 5½ coils	8½	8	68
52075	5	Journal spring seat outside	Cast steel	8	4	32
52075	6	Journal spring seat inside	Cast steel	6¾	4	27
						557½
52505	22	Bolster	4 ft. 11 in. x 2 ft. 6 in.—⅜-in. steel plate	139½	1	139½
52833	27	Double roller side bearing	Case and bearing, cast steel outside and inside rollers and pins; case-hardened high carbon steel.	38	2	76
	26	Center plate	Ball bearing	29½	1	29½
52016	24	Bolster elliptic spring seat	Cast steel	14	2	28
52505	23	Bolster bracing	2 in. x ¼ in. and 4 in. x ¼ in. open-hearth steel		4	13
52505	19 & 20	Bolster rubbing plate	5 in. x 11 in.—$\frac{5}{16}$-in. steel plate	2¼	4	9
52505	25	Bolster rubbing plate	5 in. x 6 in.—¼-in. steel plate	3¾	4	15
52075	30	Bolster tie strap	3 in., 4 lb., channel, 20½ in.	8	2	16
51985	53	Bolster damper plate		10½	2	21½
51985	54	Bolster damper plate bracket		5¼	4	21
52232	28	Bolster full elliptic spring	10⅜ in. high over bands, 9½ in. wide over bands, 34 in. between centers; leaves, 4 in. x $\frac{13}{32}$ in.; bands, 3 in. x ⅜ in. (maximum deflection, 4⅛ in.; weight, 190 lb.)	190	2	380
52453	21	Spring plank angle	1½ in. x 2 in. x ¼ in.—3-ft. 3½-in. angle iron	9	2	18
		Spring plank saddle	Cast steel	23	2	46
51993	16	Spring plank hanger	Soft steel forging	25	2	50
51993	17	Spring plank pin	1¾ in. round machine steel 19¾ in. long	11¼	2	22½
		Spring plank hanger key	½ in. x ½ in. x $1\frac{11}{16}$ in., soft steel	1½ oz.	4	⅜
51993	18	Spring plank bracket	Cast steel	3¼	4	13
						898⅛
53100		Wheel	33 in., cast iron	500	4	2000
52881		Axle	4½ in. center, 3¾ in. x 7-in. standard journal, 6-ft. journal center	353	2	706
						2706
52585	31	Brakebeam	7 in. x ¾ in.—5-ft. 8-in. open-hearth steel	97½	2	195
52595	33	Brake lever fulcrum live	Forging, 4 in. x ½ in., open-hearth steel	11½	1	11½
52595	34	Brake lever fulcrum dead	Forging, 4 in. x ½ in., open-hearth steel	9	1	9
52585	35	Brake lever live	1 in. x 4 in., 24⅞ in. long, open-hearth steel	20½	1	20½
52585	36	Brake lever dead	1 in. x 4 in., 24⅜ in. long, open-hearth steel	19	1	19
52595	37	Brake lever bracket live	Forging, 1½ in. x ½ in., open-hearth steel	5	1	5
52595	38	Brake lever bracket dead	Forging, 2 in. x ½ in., open-hearth steel	5½	1	5½
46515	40	Brakeshoe head, left	Malleable iron	23	2	46
46515	41	Brakeshoe head, right	Malleable iron	23	2	46
46892	43	Brakeshoe key	American Electric Railway Association standard	1	4	4
46873	42	Brakeshoe	American Electric Railway Association standard	23	4	92
34383	44	Brakeshoe hanger	Drop forging	4¼	8	34
34383	32	Brakeshoe hanger holder	Malleable iron	8¼	4	33
34383	45	Hanger pin and spring		¾	8	6
		Hanger pin cotter pins				⅞
52595	29	Brake release spring	3 in. x ½ in., steel plate	4½	4	18
52675	2	Brakebeam safety guard	2 in. x 2½ in. x ¼ in.—2-ft. 6½-in. angle iron	7½	2	15
52585	39	Bottom brake rod	Drop forging, 1¾ in. standard turnbuckle; this brake rod has been replaced with automatic slack adjuster	37	2	74
						3340⅜
52353	48	Motor support bar	1 in. x 5 in., Norway iron	48	2	96
52353	56	Motor support spring (upper)	3 in. x 4½ in.—⅝ in. wire, 5 coils	$3\frac{3}{16}$	4	12¾
52353		Motor support spring (lower)	2⅝ in. x 3½ in.—$\frac{7}{16}$ in. wire, 5½ coils	2½	4	10
52353	57	Top cap for upper spring	Malleable iron	15 oz.	4	3¾
52353		Top cap for lower spring	Malleable iron	12 oz.	4	3
52353		Bottom cap for lower spring	Malleable iron	¼ oz.	4	4¼
52353		Bottom cap for upper spring	Malleable Iron	¼ oz.	4	5
52353	55	Motor supports spring bolt	1 in. x 12½ in.	3⅝	4	14½
		Rivets				59
		Bolts, etc				66½
						275
Grand total						6186½
Truck as weighed complete						6080
52863	47	Pilot board	8 ft. 4 in. x ½ in., steel plate	25¾	1	25¾
52863	49–50	Pilot-board hanger	9½ in.—3½ in. x ⅝ in., open-hearth steel	4½	2	9½
52863	51–52	Pilot-board hanger	10⅜ in.—3½ in. x ⅝ in., open-hearth steel	4½	2	9
						44½

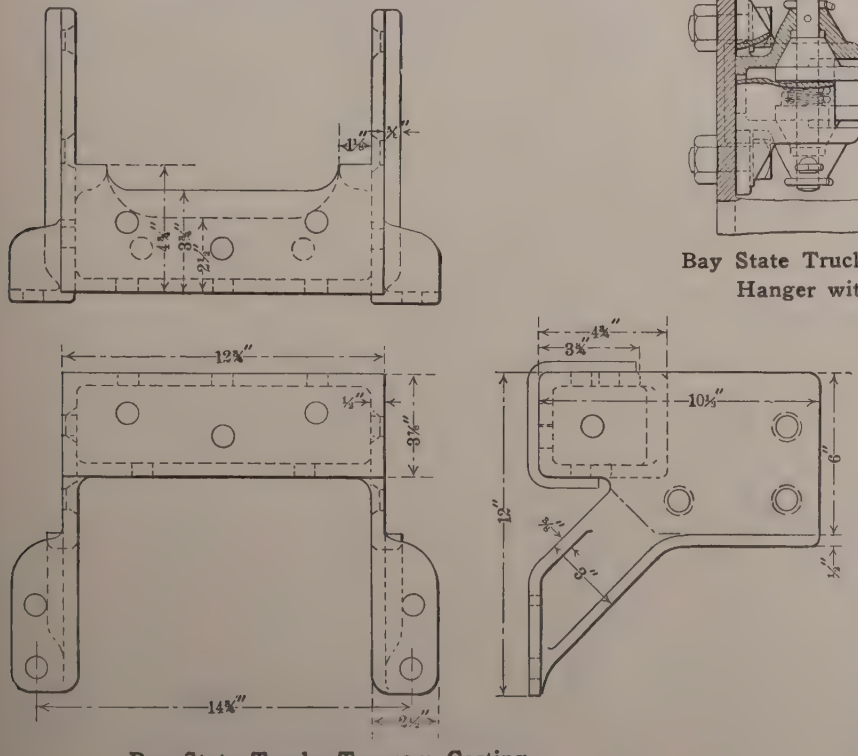
lined with babbitt on the inside face, the metal being held in place by being allowed to harden after it has been poured through tapering holes on the opposite side. A photograph on this page of the truck assembled, as reproduced in part, shows the end-thrust bar in position in an opened journal box.



Bay State Truck—Details of Journal Box Showing Pocket for End Thrust Bar

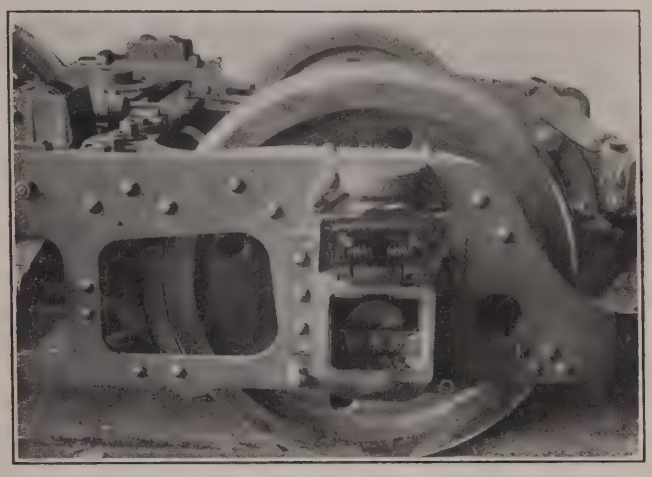
The brake rigging is inside hung and includes the company's adopted standard non-chattering, self-adjusting brake hangers, American Electric Railway Association standard shoe, shoe head and key, brakebeams, levers, release springs and automatic slack adjusters.

The slack adjuster used on this truck (in place of part No. 39, illustrated in accompanying halftone engravings of detailed parts of truck on page 615) is of the Standard Coupler Company's shim type. Symington journal box covers are used. Credit for the idea of using boiler plate for the side frame is due to the American Locomotive Company.



Bay State Truck—Transom Casting

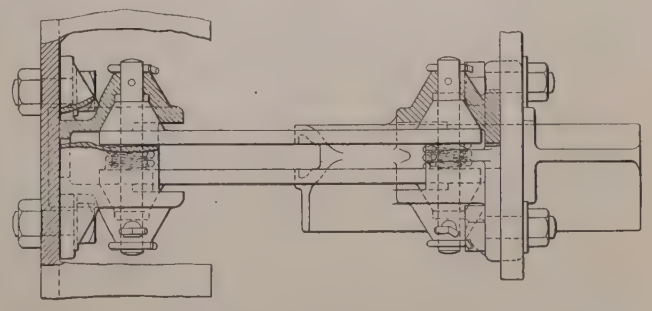
The brake levers and their fulcrums are bushed with steel tubes and all pins are case-hardened. All axles are made from the American Electric Railway Association's high-test, heat-treated specification, and the wheels are of the "FCS" Griffin cast, some steel wheels of the association's recommended specifications also being used. All material in the trucks was carefully checked by professional inspectors. The trucks were fitted and built on jigs and all bolts connecting the transom casting to the gussets and side frame were tapered and turned. All holes were drilled to a size smaller and reamed out to suit the bolts, which are hammer-driven.



Bay State Truck—View Showing Integral Guides Cast in Journal Box

NON-CHATTERING BRAKE HANGER

The non-chattering brake hanger, shown in the diagram below, has been adopted by the Bay State company as its standard and has been in constant use for about four years. About 350 cars have so far been equipped with it. It consists of two drop-forged hangers with a 60-deg. taper, placed opposite each other with a spring between pressing them into pockets in a solid steel casting, and with a ¾-in. pin through the center of the hanger and the pocket. The pin is fastened with cotters on each side of the holder. The hangers are interchangeable, as the top and bottom lugs are made alike. The holes through the hangers for the pins are made slightly larger than the latter so that the greater part of the bearing surface comes on the tapered portion of the hanger itself. A double wearing surface is thus provided on the inside and outside of the hanger. The constant pressure automatically takes up the slack, leaving the double bearing surface as indicated. The springs are of 500-lb. capacity compressed to ⅞ in. The



Bay State Truck—Assembly of the Non-Chattering Brake Hanger with Drop-Forged Hangers and Springs

hangers first installed are still in service with comparatively little wear. The hanger is designed to suit either shoe header, whether bolted on the brakebeam or otherwise, and is built with an opening to permit dirt to work its way through. The hanger was patented in 1907 by E. W. Holst.

The table and photographs on pages 615 and 616 show the number and weight of every individual part required in the assembly of the completed truck, with the material, dimensions and shape of each. The total weight of all truck parts, including wheels and axle, aggregates 6186.5 lb. and the check weight of the truck complete, without motors, is 6080 lb. The officials of the company who were directly responsible for the work described were C. F. Bancroft, superintendent of motive power and machinery, and E. W. Holst, superintendent of equipment.

Name, Size and Weight (in Lb. per Truck) of Bolts and Rivets.

Rivets.		
24 Round head rivets in end bars	¾ in. x 2½ in.	10½
8 Round head rivets in motor spring seats	½ in. x 2½ in.	1
28 Round head rivets in gusset plate	¾ in. x 2½ in.	12¼
16 Round head rivets in journal spring seat	¾ in. x 4 in.	10
8 Round head rivets in journal spring seat	¾ in. x 2½ in.	3½
24 Round head rivets in pedestal rubbing plates	¾ in. x 2¾ in.	10½
8 Round head rivets in transom casting	⅝ in. x 2½ in.	3
12 Round head rivets in brakebeam safety guard	⅝ in. x 2 in.	3
8 Round head rivets in bolster bearing plate	½ in. x 1½ in.	1
12 Round head rivets in bolster bearing plate	½ in. x 1⅞ in.	1½
8 Round head rivets in bolster rubbing plate	⅝ in. x ⅞ in.	1
4 Round head rivets in bolster rubbing plate	⅝ in. x 1½ in.	1
4 Round head rivets in bolster spring seat	⅝ in. x 1¼ in.	¾
		59
Bolts.		
12 Machined in gusset plates, milled	¾ in. x 2 in.	7¼
6 Machined in transom casting, milled	¾ in. x 2½ in.	3⅝
10 Machined in transom casting, milled	¾ in. x 1⅞ in.	5
4 Machined in transom gusset, milled	⅞ in. x 2¾ in.	4
4 Machined in transom gusset, milled	⅞ in. x 3 in.	4
12 Machined in hangers milled	¾ in. x 2⅝ in.	7¼
4 Machined in bolster strap, rough	¾ in. x 2⅝ in.	2½
8 Machined in side bearing, rough	¾ in. x 2 in.	4½
4 Machined in center plate, rough	¾ in. x 1⅞ in.	2¼
6 Machined in rough	⅝ in. x 2 in.	2⅛
4 Machined motor bolts, rough	1 in. x 12½ in.	14½
8 Hexagonal in bolster hanger bracket, roughed	¾ in. x 2½ in.	4½
4 Hexagonal in lever guides, roughed	¾ in. x 2½ in.	2¼
4 Hexagonal in life-guard hangers, roughed	¾ in. x 2¾ in.	3
4 Hexagonal in life-guard hangers, roughed	¾ in. x 2⅝ in.	1½
8 Hexagonal in life-guard hangers, roughed	⅝ in. x 1½ in.	3
2 Bolster damper spring bolt, roughed	¾ in. x 4⅜ in.	1½
32 Cast steel in pedestal, roughed	½ in. x 1¼ in.	4
		66¼

IMPRESSIONS OF AMERICAN CARS

BY ANTON BEYNES, OF J. J. BEYNES COMPANY, CAR BUILDERS, HAARLEM, HOLLAND

A horse street car in America! This is a fact. Soon after my arrival in the metropolis I visited the well-known Battery Place and was quite astonished to see a street car whose only motive power was a horse. Conditions of place and difficulties not easy to overcome are the main reasons for this old-fashioned type of transportation. But the time is not far distant, I believe, when the accumulator car will be seen not only on Battery Place but on many other short-distance lines where the trolley system cannot operate as economically. In cases where traffic is of comparatively low density or the service desired is infrequent the storage battery car will be the car of the future. Another main point to look upon is that the investment required by storage battery cars is small, and, again, the maintenance expense is low.

It is my opinion that American people patronize the street car more than any other people in the world, because the low fare and the great distance from office and workshop to their homes almost compel people to travel. Most of the railway companies do their utmost to please their passengers in the way of comfort and safety. The only thing that they do not appear to trouble much about is the seating capacity.

I was much interested in the low-entrance car now being tested in New York and Pittsburgh. I think this is a great scheme. It will increase the speed of loading and unloading a great deal. It was indeed high time that the engineers took the height of the step into close consideration, for in most of the cities which I visited it was laughable to see people almost "climb" into a car. A high step-board from 20 in. to 24 in. might be attached to a car on account of curves, local conditions, etc. To surmount these steps may be very easy, but I think not.

Another quite new design on the market is the double-decker, a type similar to the London omnibus and other street cars which have been running a long time in England, although they differ in many ways from the American type. New York and Pittsburgh are once more the leaders in these trials. As descriptions of these cars can be found in recent issues of this journal, I would rather listen to American comment than to utter my own opinion. The only thing I am very anxious to know is whether the average American man is or is not born for the two-story car. I say the average "man" because I suppose that the fair American finds her seat on the first floor at the same time that the strong sex goes upstairs in order to have a smoke. Now, for the average man loading and unloading might go too slowly, for there is no doubt that this type of car cannot be "cleaned" as quickly as the single-deck car of to-day; but it is a splendid car for the company. I dare say it is a money-maker, for in Pittsburgh an official told me that they carried easily as many as 200 passengers in one car.

The most up-to-date car, with such features as the low entrance, prepayment operation, light weight, all-steel construction and great seating capacity, is, according to my opinion, the Brooklyn center-entrance car. All steel, yet of light weight, it raises a question that every car builder in this country should carefully consider. What is the use of dead weight? It is expensive for the company—that's all. What I also like in the Brooklyn car is, first, the flat-arch type of roof; second, that it is painted in white enamel, which gives a pleasant and bright appearance, and, third, the satisfactory roof lighting by three rows of lamps.

From a car builder's point of view I am very much in favor of the lately built cars running on the lines of the New York, Westchester & Boston Railway. Comparing the design and construction of these cars with others of their kind, as well as with the all-steel railway cars, I highly recommend the Westchester car for the simple reason that its strength is more equally divided between the underframe and the sideframes. I do not believe in a heavy-weight, solid underframe only. I know that an underframe has to stand all kinds of bumping and shocks, but give the sideframes as well a part in the work. Build them stronger and with cross braces.

On my trip through America I have been pleased with two other types of cars which I should like to mention. One of them is the near-side car in Buffalo, which has both the conductor and the motorman on the front platform, while the doors and steps are operated by the motorman, which I think is a very good safety scheme. The other car is that of the Pittsburgh Railways Company, which has the length of a suburban car, with one longitudinal seat on one side and cross-seats opposite, prepayment operation, and, last but not least, the exit on the front platform. When people are thoroughly instructed in moving along to the front platform for exit instead of leaving by the entrance at the rear, an increase of speed in operation and better service to the public will be obtained at the same time.

Of all the things I have seen in the way of electric cars and equipments, I do not think I could introduce much abroad on account of the different conditions. In conclusion I am glad to say that I take with me a good impression of your enterprising engineers, who dream about a mechanical or electrical proposition one night, start experimenting and developing it the next day, finish the drawings within a fortnight, and a couple of weeks later people are able to see a new technical wonder.

Report on Transportation in San Francisco

Preliminary Statement by B. J. Arnold in Regard to Steps Open to the City for the Development of Existing Railway Facilities—Comprehensive Franchise Ordinance and Co-operation Between Municipality and Corporation

Bion J. Arnold, who is making an investigation of the transportation conditions in San Francisco, has issued preliminary report No. 9. This discusses some of the principal factors involved in the solution of the problem of transportation at present and in the future. An abstract of this report follows:

GROWTH OF THE DISTRICT

"Within the short space of sixty years San Francisco has not only developed its utilities as have other American cities within the same period, but, most important, it has developed its city, extended its waterfront, reclaimed its sand dunes, settled its hillsides, and is now face to face with the serious problem of forcing its utilities to keep pace with this rapid municipal development. And with the utmost certainty of tremendous expansion under the impetus of the Panama Canal the city is just beginning to realize the difficulty of coping with this expansion in the face of competition of neighboring and other coast cities which have been extremely active within the past few years in perfecting their facilities for handling the expected commerce.

"The utilities have advanced rapidly in earning capacity, more especially railways. But for the past decade, unfortunately, there has been practically no expansion. On the contrary, a tendency to concentrate and to increase earnings has manifested itself. At least one-third of the city is practically unpopulated through lack of necessary utility service —railway and water—while it is a fact that the southerly districts of this city embrace residential development sites exceeding in natural advantages anything in the district, especially in convenience of transit when proper facilities are provided.

METROPOLITAN DISTRICT

"If the existing municipal boundaries are obliterated from the map of most large cities it will be found that the broad movements of population are usually quite independent of them, and that radiating lines of development extend in all directions as far as the topography of the country will permit, until the limitation of time or cost of transportation is reached.

"This limitation finds its best expression in the thirty-minute time zone, which generally represents the limit of thickly settled sections for the reason that the average business man cannot afford to spend more time in transit.

"The time zone map of San Francisco reveals the peculiar situation that, although the greater portion of its area could be reached within thirty minutes by improved methods of transportation, yet at the present time only about half of its area has been developed. On the other hand, the daily migration of business population across the bay has no parallel in this country, with the exception of New York City. This is all the more astonishing when it is considered that none of the trans-bay commuters is able to reach land within thirty minutes from the business center of San Francisco.

"The one really logical development, by steam road down the peninsula, shows a volume of traffic which is relatively inconsiderable and, moreover, has remained practically stationary in spite of the fact that millions have been spent in the construction of an improved rail entrance into the city by tunneling through the various ridges interposed. That this extremely unbalanced development has occurred in spite of more rapid peninsular service shows that it is largely due to the high cost of transportation. This is apparent from a comparative study of the time zone and rate zone maps published herewith. While a 5-cent commuter fare reaches the north of Berkeley, for the same time distance down the peninsula a fare of 13⅓ cents is charged.

"That the rapid trans-bay suburban expansion of the past few years cannot continue in the future is shown by the fact that the probable limit of quick transit has been reached by a development in electrification which finds no parallel in this country, and as the fare could not conceivably be any lower, the filling up of the suburbs now laid out will tend to determine the future limits of trans-bay settlement.

"San Francisco, on the other hand, will always continue to be the business and social center; and instead of attempting to curtail trans-bay development it should turn to the development of the immense acreage within its own borders and down the peninsula. A most essential factor is that transportation must precede settlement of any territory.

RIDING HABIT

"That the people of San Francisco are responsive to improved transportation is shown by the fact that the riding habit, as expressed in earnings per capita from transportation, is here the highest of all the cities in the country and almost twice as high as the average city, even exceeding Los Angeles in this respect. This is due very largely to the prevailing liberality of its people, but also to the fact that the earnings from transportation are partly made up from daily business population, while the census is based upon sleeping population. And, inasmuch as the daily trans-bay commuter traffic is fully 23 per cent of the population of San Francisco, this results in earnings per capita as high as $18 to $20, as against $10 and $12 for the average American city of moderate size. This fact constitutes the one prime source of optimism regarding the city's future development. The earning capacity is available. It only remains to develop a transit policy commensurate with the opportunity and to execute this policy with courage and dispatch.

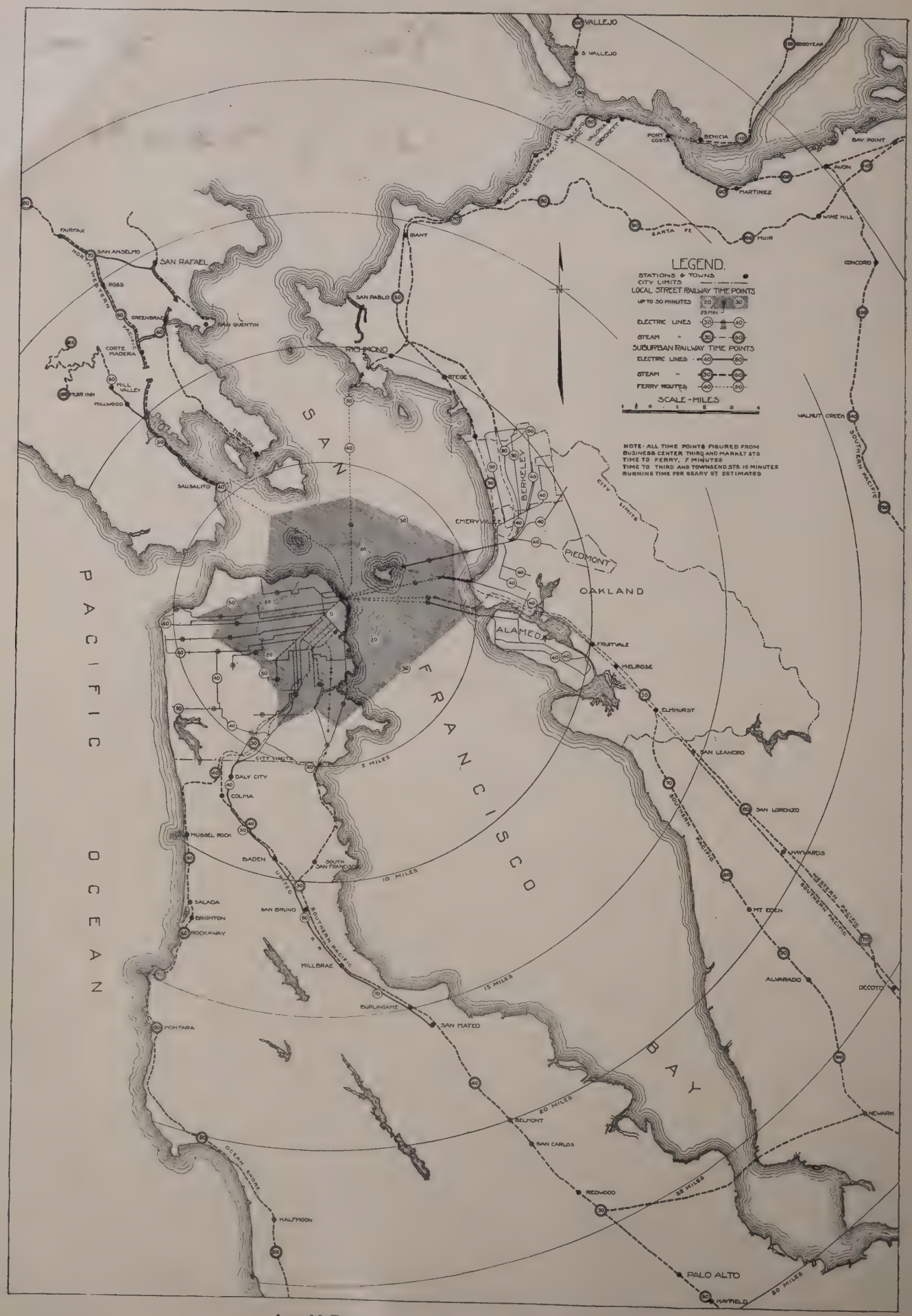
CITY PLAN.

"It is most unfortunate, though readily understood, that the financial condition of the community immediately after the disaster of 1906 did not permit of some improvements in the city plan which would serve to rectify some of the blunders in the original plan, and particularly in the way of diagonal supplemental thoroughfares by which the hills could be avoided and short cuts found for more convenient transit. I believe that in some of these enterprises it is still not too late to consider them, as this should be done before the property values have risen to prohibitive figures.

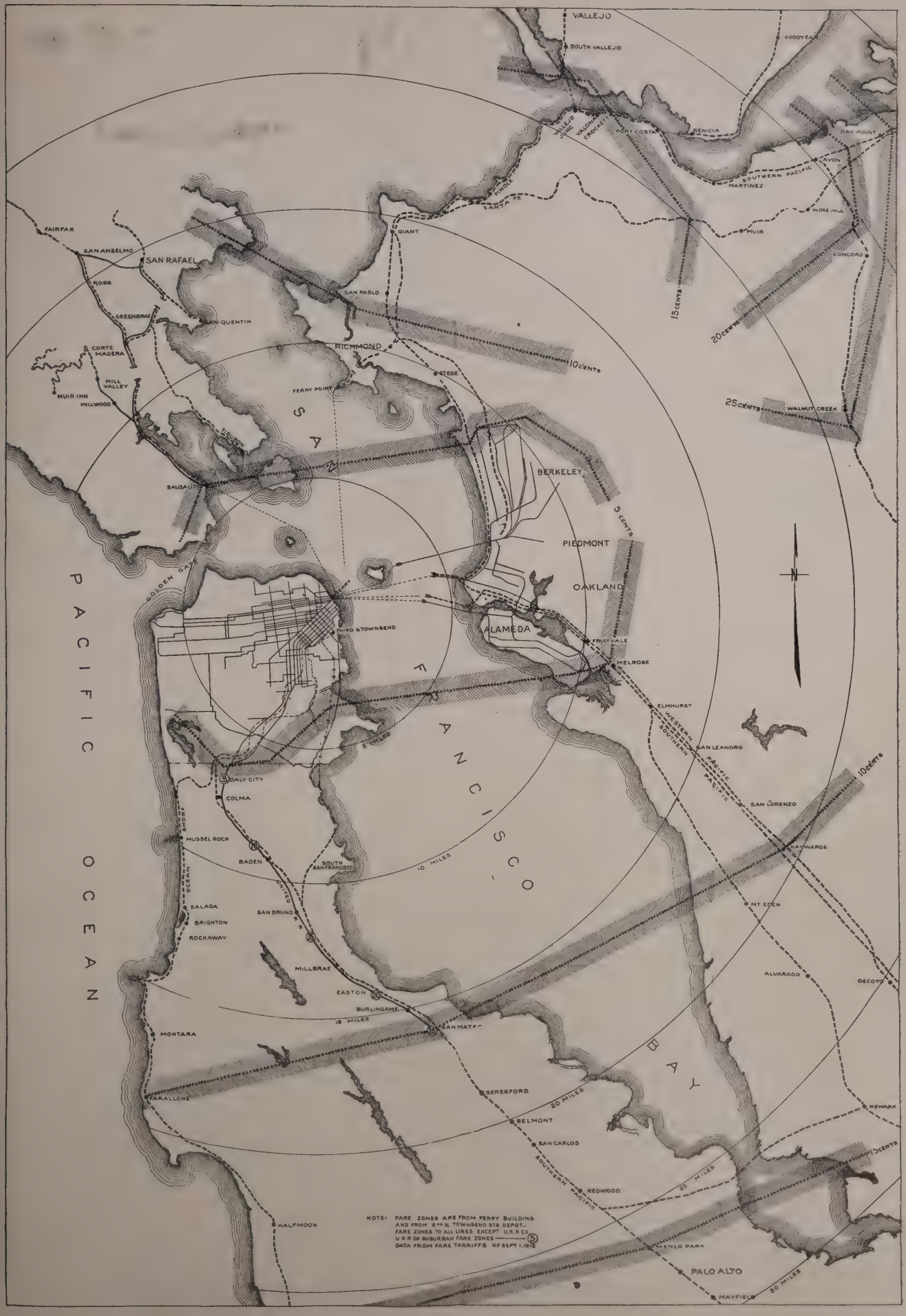
"For example, I shall make recommendations for certain street extensions, regradings, contour subdivision of hill property, re-subdividing of some present rectangular hill property, improvement of the Embarcadero, rationalizing the present plan of sidewalk widths, methods of crossing the park, the segregation of preferred transit routes from automobile and trucking thoroughfares, etc.

SERVICE AND REHABILITATION

"A large amount of rehabilitation work still remains to be done in various parts of the city, although the extensive reconstruction following the disaster of 1906 is responsible for the electric track in many parts of the city being in very good condition at the present time. Although much of the rolling stock is in good condition, a considerable portion will have to be retired at an early date either entirely or else confined to the outlying districts, only the largest and most modern equipment being permitted on the downtown streets. The introduction of the prepayment principle has brought about the necessity of certain changes in the more modern equipment now in operation, especially in platform



Arnold Report on San Francisco—Time Zone Map



Arnold Report on San Francisco—Fare Zone Map

capacity, so that even with the addition of the new equipment contemplated much rehabilitation and improvement work will have to be carried out.

"The results of traffic counts indicate a wide variation in the general character of service on the individual routes, some of which appear to be favored, others neglected, both with respect to frequency of headway and type of equipment, resulting in excessive car loading on certain routes, all of which can be remedied only by additional equipment and rerouting of cars, with such service redistribution as the individual route counts show to be necessary, thus saving considerable useless car mileage for operation when and where most needed, as determined by the riding habit of passengers.

"Although the company is operating practically up to its published schedule, even the addition of the sixty-five new cars ordered and the few being reconstructed at the company's shops will barely suffice to realize a proper standard of rush-hour service, irrespective of the future demands of the Panama-Pacific Exposition traffic.

"An exceedingly liberal transfer system is in effect—in fact, so liberal as to permit of extensive 'loop riding' for a single fare—and the city should co-operate in any feasible plan to reduce loop riding without considering this as a curtailment of the franchise privilege, for every return fare thus stolen by a dishonest patron has to be paid for by the honest patron.

"The present traffic of electric lines is far beyond the maximum possible capacity of any cable system.

"Re-routing will involve some readjustment of the labor schedule, as any increased rush-hour service as compared with day service will mean an increase in short-time trainmen. Increased investment will be necessitated to provide this rush-hour service desired, and all these factors focus in the corporate income account and the operating ratio. It is thoroughly impracticable for a regulative body to proceed blindly with the ordering of service or equipment without determining whether the income will warrant such an increase; for it must be remembered that the street railway is the only utility operating with a fixed maximum income unit—5 cents—which provides no flexibility whatever in the adjustment of operations to returns as in other utilities, and necessitates the cutting of the operating cloth to fit the financial pattern.

TRANSIT DEVELOPMENTS

"From an economic standpoint, duplication of investment is improper and unjustifiable; so that the municipal system may find its most logical expansion along lines of development rather than competition.

"At the present time San Francisco absolutely requires a large increase in mileage, but the fact exists that under the conditions that have been imposed, in the hope of immediate results, no doubt, not one foot of extensions may be expected from private capital.

"In my judgment certain steps could well be taken at the present time to remedy these conditions:

"'First, the charter may be amended so as to make private investment possible.

"Second,. present corporate franchises may be merged on some equitable basis of equalization, with extension franchises desired.

"Third, dup'ication of investment may be avoided by non-competitive extensions, with the object of ultimate unification of the entire property at the lowest possible investment cost.

"The question of a sane, reasonable and workable franchise agreement between the city and the United Railroads is the first great matter to be settled, to which all others are subordinate, and no time should be lost in formulating a plan for submission to the voters in November.

"It is necessary for me to say here that the evolution of this much-desired plan will not be furthered by the use of old arguments and the use'ess discussion of former abuses and unfortunate occurrences in the history of civic and traction development, by both sides of the controversy, to force concessions. Progress is not retroactive. Conditions exist to-day as they are, without reference to the past, and a solution must be found for to-day and to-morrow, rather than yesterday. Consequently, the application of radical restraints to the present situation will utterly defeat the purpose of the sober and determined citizens of this city to record a fresh page in the history of their civic development.

REGULATION AND SUPERVISION

"Regulation must be practical and not punitive, and one of the first requisites is for the municipal legislative body to create and maintain a commission of technically trained men to carry out this business and relieve the legislative body from the consideration of the innumerable details of such a business. The time and training of a legislator does not permit him to engage in the operation of a public utility."

A program for immediate and for subsequent development is given as an appendix to the report.

TIME ZONE AND FARE ZONE MAPS

The description of the time zone and fare zone maps is as follows:

"The shaded contour areas and time points within circles on the time zone map indicate how far commuters may ride in ten-minute intervals from the center of the business district, Third and Market Streets. An average time allowance of seven minutes to the ferry terminal and ten minutes to the railroad terminal at Third and Townsend Streets has been made. The inner shaded zones correspond to the running time by electric and cable lines; the double circles and outer zones, more particularly to steam lines. Relative running speed is indicated directly by distance between these various time points. For steam trains the time shown is on limited local trains passing by only the less important stations. Some limited expresses make 26 per cent better time and way locals 15 per cent slower time than here indicated. While practically half of San Francisco lies within the thirty-minute time zone, none of the trans-bay commuters reaches land within that time. All of San Francisco is reached within an hour, the same as the trans-bay districts. For the latter, from one-fourth to one-half of the time is consumed in the water trip. With the same character of rapid transit equipment it appears that from twenty to thirty minutes additional running time will always be necessary, by reason of the water trip, for trans-bay commuters to reach their homes than it will be for San Franciscans.

"The fare zone map is similar to the time zone map, indicating by shaded contour lines the commuter areas covered within successive fare zones of 5 cents, 10 cents and 15 cents, etc., all of these fares figured from the present terminal points in San Francisco, viz., the ferry terminal and the railroad depot. From the business district an extra 5-cent fare should be added for commuters riding to the ferry or depot. These fares are the lowest regular monthly rates obtainable in the form of monthly commuter books. For the San Mateo electric line fares are indicated in circles, as no commutation rates are available. The relative revenue per passenger mile is indicated by the relative distance between these fare zones. From a fare standpoint, San Francisco, Oakland, Berkeley and Alameda are already unified, while the peninsula development is automatically placed under a handicap of considerably over 100 per cent for local service and 200 per cent for express service, in excess of the basic cost of transportation within the 5-cent zone. While the 5-cent commuter fare reaches to the north of Berkeley, a fare of 13⅓ cents is charged for the same time distance, that is, to about Redwood Station, or midway between the corresponding limits of way local time to Beresford (11.68 cents fare) and limited express time to Palo Alto (15.83 cents fare)."

ONE-MAN PREPAYMENT CARS FOR LOCKPORT, N. Y.

The International Railway Company, Buffalo, N. Y., is now putting on its city lines at Lockport twelve one-man near-side cars built by The J. G. Brill Company, which, although the first of this type, show a remarkably complete development in p'an and detail. The Near-Side Car Company, of Philadelphia, in designing this car had the advantage of the wide experience gained through the development of the double-truck near-side type and its operation under a large variety of conditions.

One-Man Near-Side Car—Looking Toward the Single Platform

In recent years greater attention than ever before has been given to the development of more efficient and economical types of city cars. As a logical outcome of this study applied to lines where the traffic is comparatively moderate, the single-truck car with a one-man crew has been produced in a number of different forms. During the past two years cars of this kind have been installed in such cities as Brunswick, Ga.; Missoula, Mont.; Muskogee, Okla.; Waco, Tex.; Selma, Ala., and Freeport, Ill. The present installation is notable as the first application of the one-man near-side car by a large electric railway system.

In all cases of one-man operation of prepayment cars it is obvious that, whatever the type, the car is necessarily operated at the forward end, and as the entrance and exit are at this end, it follows that the stops must be made at the near side of the street. This fact alone indicates that the near-side type of car is well adapted for one-man operation.

As shown in the accompanying illustrations, the one-man car is generally similar to the double-truck near-side car in appearance, seating plan, platform arrangement, door and window systems, form of roof and type of ventilator. The emergency door at the rear of the longer car is omitted in the shorter, as the distance between the rear seats and the platform makes it unnecessary. The location of the motorman-conductor gives him a clear outlook in all directions and facilitates the operation of the car to the utmost degree. The control apparatus, switches and signs are within easy reach. The use of air brakes on single-truck cars is unusual but is included in this equipment to relieve the operator of as much fatigue as possible and so increase his efficiency. The door-control handles are arranged at one end and operate the entrance and exit doors in unison or independently. The front of the vestibule has the unusual feature of being constructed with two windows, the upper sashes of which are used for illuminating, destination and route signs. The side windows are of the Brill semi-convertible type with brass stiles and each upper sash is hinged to form a waterproof joint. The seats are also of the car builder's manufacture and are of a special type, no aisle plate being used, but the pressed-steel parts which support the back are designed to pass under the cushion. This seat, which was specially designed for the near-side car, is claimed to be the lightest two-passenger cross seat which has ever been built, as it weighs but 35 lb. Five mushroom-type ventilators are used per car to furnish an exhaust capacity considerably in excess of the requirements of the boards of health of the principal cities.

One-Man Near-Side Car—General View of the All-Steel Underframe, Including the Platform

One-Man Near-Side Car—Two-Sash Vestibule Front and View of Car with Doors Closed and Steps Up

The underframe is composed of steel, with the side sills of 14-in. x 3/16-in. plate, reinforced at the top with 2-in. x 1-in. x 5/16-in. and ¼-in. angles and at the bottom by 2½-in. x 2½-in. x ¼-in. angles. The end sills are formed

of 9-in. channels and the crossings of 4-in. and 5-in. channels. The corner posts are 2¾ in. thick and the side posts 2¼ in. thick. The sweep of the posts is 1⅝ in. The floor is composed of ⅝-in. hard maple over 13-16-in. yellow pine with 1/16-in. building felt between. From a point 6 ft.

One-Man Near-Side Car—View of Car with Doors Open and Steps Down

back from the front end sill the floor slopes 2 in., making the step from the car floor to the platform 6¼ in., from the track to the folding step 13 in., and from the folding step to the platform 13 in. The cars are mounted on trucks of the No. 21-E type with wide-wing journal boxes. A wheelbase of 8 ft., together with the superior spring system, gives easy riding qualities and prevents any bounding motion.

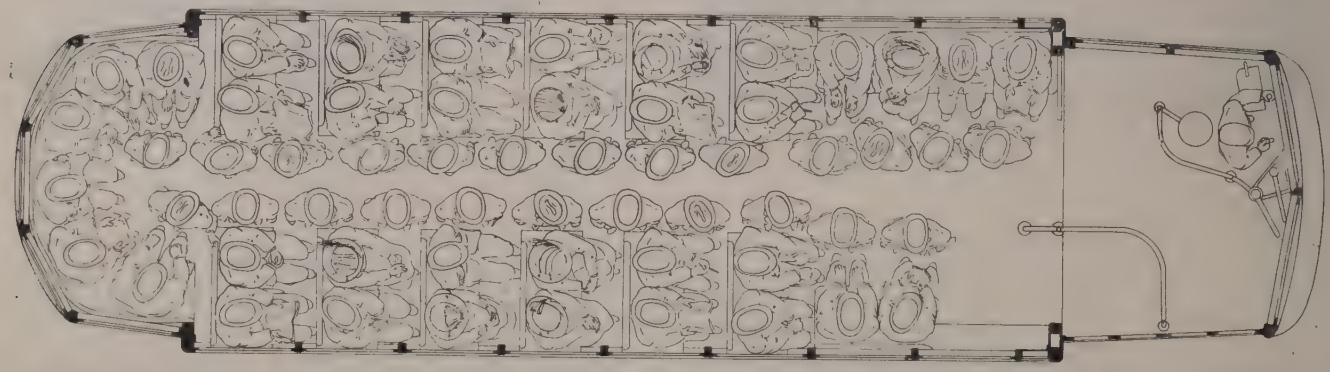
One-Man Near-Side Car—View of Entrance and Exit, Showing Folding Steps, Railing, etc.

The principal data on this car may be summarized as shown in the following table:

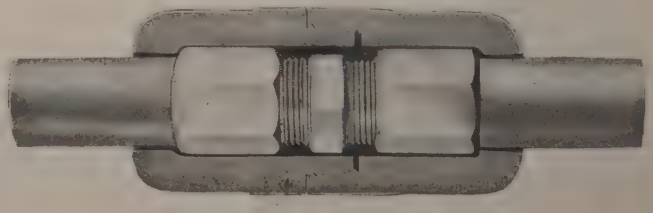
Length over corner posts	21 ft. 0 in.
Length over platforms	30 ft. 7½ in.
Length of front platform	5 ft. 6 in.
Length of rear platform	4 ft. 0 in.
Centers of side posts	2 ft. 6 in.
Width over sills	7 ft. 9½ in.
Width over posts	8 ft. 0 in.
From track to side sills	2 ft. 1⅜ in.
From rail over trolley boards	10 ft. 8¾ in.
From floor to ceiling	7 ft. 6 in.
Track to step	13 in.
Step to platform	12 in.
Seating capacity	36
Type of trucks	Brill No. 21-E
Wheelbase	8 ft. 0 in.
Diameter of wheels	31 in.
Size of journal	3¾ in. by 7 in.
Type of motors	Two 50-hp GE-200A
Weight of car body, less electrical equipment	9,500 lb.
Weight of electrical equipment	1,100 lb.
Weight of air-brake equipment	1,200 lb.
Weight of trucks	5,220 lb.
Weight of motors	5,600 lb.
Total weight	22,620 lb.
Weight per seated passenger	628 lb.

INSULATING COVER FOR CABLE CONNECTORS.

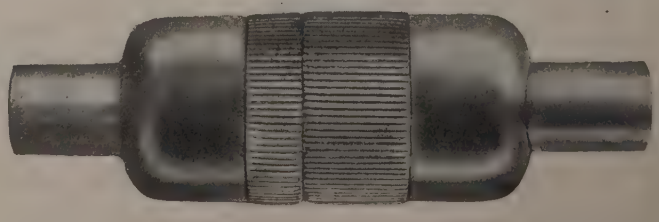
A special form of insulating cover for use with Dossert connectors has recently been placed on the market. This cover is applicable only to connectors for joining conductors ranging in size from No. 0 B. & S. gage to 250,000 circ. mil. The general construction is shown by the cross-sectional view. It differs from the insulating covers furnished for connectors used with wires smaller than No. 0 B. & S. in the respect that it is held in place by means of shoulders at the outer ends of the connector, instead of at the center. The covers, as shown, are made in two parts with a threaded coupling. The conductor openings range from 25-32 in. to 29-32 in., accommodating various thicknesses of insulation. The second cut shows the appearance of a completed joint with its cover. The manufacturer states that other sizes will be added as occasion re-



One-Man Near-Side Car—Bird's-eye View of Car Floor Showing Thirty-six Seated and Twenty-four Standing Passengers



Cross-Section of Insulating Cover

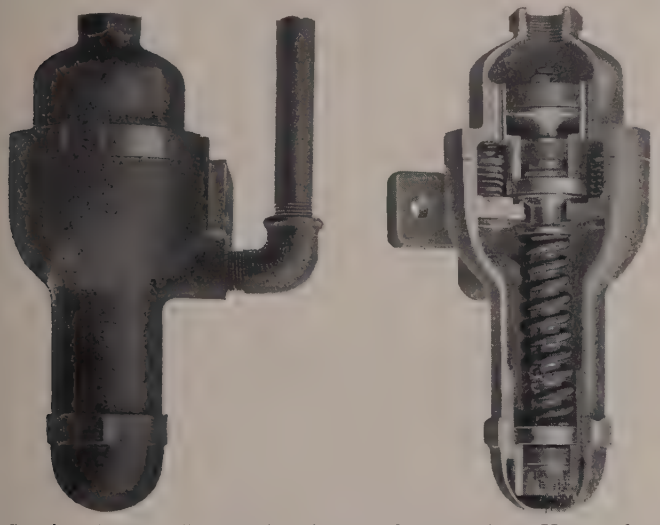


Cover for Cable Connector

quires. These insulating covers and connectors are marketed by Dossert & Company, New York, N. Y.

AIR-BRAKE SYSTEM WITH ADDITIONAL OPERATING FEATURES

An improved air-brake system has recently been invented which, among other features, permits the braking, sanding, alarm and control cut-off operations of the motorman to be performed by the manipulation of a special engineer's valve handle. Thus, in cases of emergency, the moving of this handle will operate a supplementary valve which in turn automatically deposits sand on the rail and rings an air gong in advance of the brake. Every function is performed in its proper rotation by turning the valve handle one-quarter, which allows the fork to engage the supplementary valve placed beside the motorman's valve. Special levers in the brake rigging and a cable therefrom which is connected to the controller drum automatically throw the controller to the off position whenever the brakes are applied. An additional valve in the train line gives the control of the train to the conductor in an emergency. This valve, which is operated by a cord leading to the conductor's station at both ends of the car, will perform in proper sequence all the duties of the motorman's valve. It is installed in a short-circuited air line between the reservoir and brake cylinder. The operation of this conductor's valve causes a slide valve to close the train line from the motorman's valve. The conductor's valve is effective only during the application of air, as it is returned to the normal position by means of a spring. Reference to the accompanying train-line diagram shows the conductor's valve at *T* and the slide valve at *E* in the short-circuited air line. The cable connections to the controllers and the operating lever are shown at *J* and *K*. The supplementary train line and connections are shown at *R*.

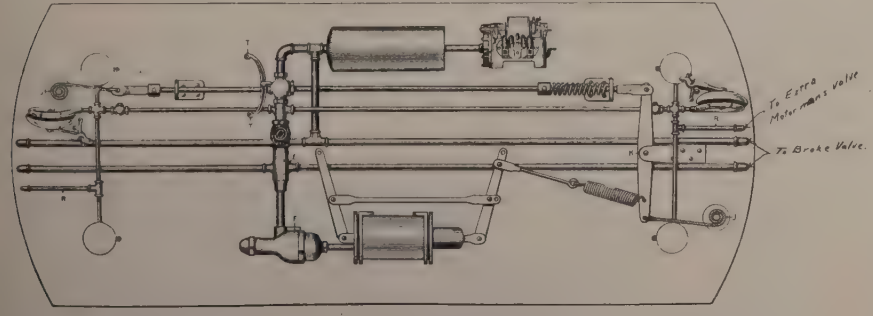


Sectional and Inclosed Views of Reducing Valve for Creating Uniform Pressure

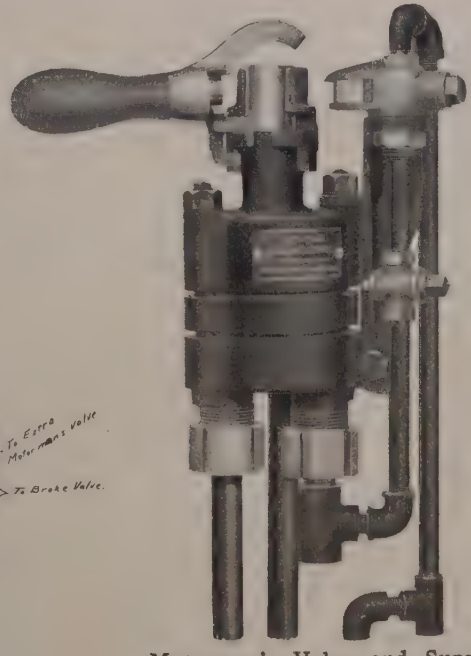
In connection with this train control equipment a new type of reducing valve for creating uniform pressure to the brake cylinder has been installed. A valve with similar functions is employed on steam railroads where clean air is usually obtainable, but inasmuch as the air commonly used on electric cars is often saturated with oil and other foreign matter, the successful operation of this valve was more of a problem than on steam railroads. By placing this valve in the train line near the brake cylinder, it registers the application quickly and is not subjected to a constant pressure.

A sectional view of the valve is shown in a halftone illustration, and its location in the train line is shown in the diagram at *F*. The air enters the upper chamber from the reservoir and passes the valve seat through openings to the lower chamber. When the pressure reaches a predetermined amount the lower plunger is forced upward against the spring, closing the opening to the upper chamber. When the air is released from the upper chamber the reverse action takes place by means of two small valves seated beside the main valve in the upper chamber. As soon as the pressure in the lower chamber exceeds that in the upper, these valves are unseated, thus allowing the air to exhaust from the brake cylinder. The car weight determines the required pressure at the cylinder for efficient braking. The compression in the spring is increased or decreased by removing the cap and turning the nut at the top of the valve stem. All parts are made accessible by inclosing the valve in a casing which is composed of six parts joined by special nipples. Should the valve fail to operate all conditions are left normal.

Both the operating mechanism and the special reducing valve were designed by Oscar Johnson, of the Scientific Railway Appliance Company, Chicago, Ill. Five equipments are now in successful operation on two of the larger street railway systems.



Piping and Equipment Layout for Air-Brake System with Additional Operating Features.



Motorman's Valve and Supplementary Valve Alongside

The American consul at Rosario, Argentina, reports that the call for tenders issued by the Municipal Council for the construction of new electric tramways in Rosario embodies a few important modifications of the preliminary draft. Tenders will be opened on Oct. 15 instead of Dec. 24, 1912, and the award will be made within one month.

SOUTHERN PACIFIC ELECTRIC LOCOMOTIVES

The first of the fifteen 60-ton Baldwin Westinghouse electric locomotives that are under construction for the Southern Pacific Company have been completed. Twelve of the locomotives are so equipped that they can be operated on 600-1200-volt direct current, and three are for 600-1500 volts. All will be used by the Southern Pacific Company on its Pacific Coast properties in freight haulage and switching service, but they are also adapted for passenger service. The mechanical parts for the engines were built by the Baldwin Locomotive Works at their Philadelphia shops, while the electrical equipment was constructed and installed by the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa. One drawing showing the names and locations of the principal electrical equipment parts and two halftone illustrations are presented herewith.

The principal dimensions are as follows:

Track gage	4 ft., 8½ in.
Wheelbase, rigid	7 ft., 4 in.
Total wheelbase	25 ft.
Driving wheels, diameter outside	36½ in.
Journals	5½ in. x 10 in.
Distance between truck centers	17 ft., 8 in.
Width over all	10 ft.
Height to top of cab	11 ft., 5½ in.
Length between coupler knuckles	35 ft.
Weight	120,000 lb.

MECHANICAL FEATURES

The trucks are of the equalized pedestal type with rectangular frames which are forged in one piece. The bolsters are steel castings rigidly secured to the frame with reamed tapered bolts. The pedestals are protected by replaceable shoes. The wheels have cast-steel centers, with tires held by bolted fastenings. The brakes are inside-hung. Westinghouse EL straight and automatic air-brake equipment is used, and a hand brake is also provided for holding the engine when it is out of service and standing in yards or on sidings.

The cab underframing consists of four longitudinal sills, each a 13-in. channel 30 ft. in length. The frame bolsters, to which the center pins are secured, consist of plates 15 in. wide x 1½ in. thick. Above these plates the longitudinal sills are strongly braced transversely by flanged plates which are riveted to the channels. Further bracing is effected by the cover plates, which are ½ in. thick. The cab floor consists of diamond plating, ¼ in. thick, which is laid on the cover plates. The end sills are of cast iron. One of the 600-1200-volt locomotives has a step at each end, while all of the others are fitted with iron pilots.

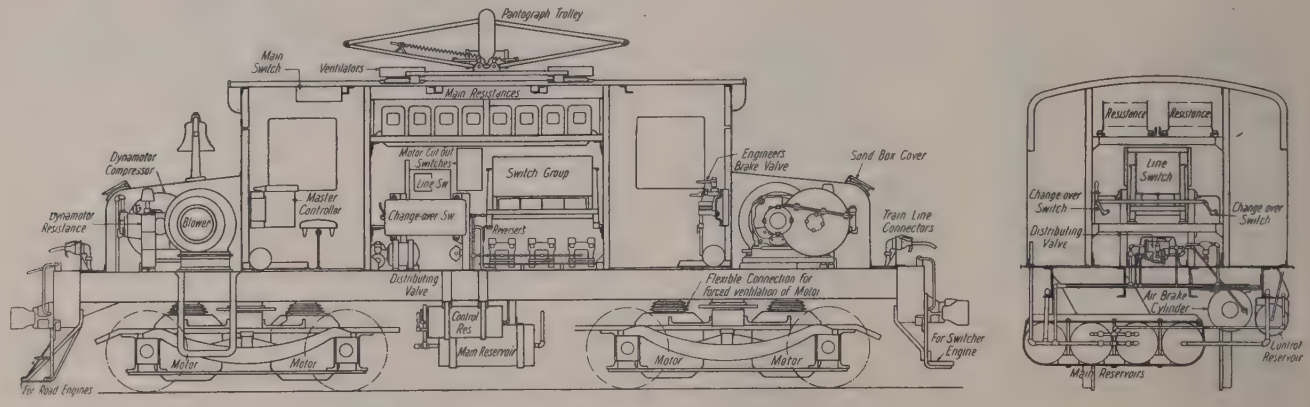
The couplers are of M.C.B. type fitted in pocket castings mounted on the end sills with their centers 33½ in. above the rail. The cab is of steel and measures 18 ft. long x 9 ft. 6 in. wide. It is centrally located and is arranged for double operation. A hood is placed at each end of the cab. There are side steps at each end of the locomotive and the cab is entered through end doors, the hood being placed out of center to give room for a wide running board on one side.

The locomotives are equipped mechanically in accordance with trunk line railway practice, Southern Pacific standards being followed where possible. The furnishings include an air whistle, standard locomotive bell with automatic bell ringer and sand boxes located in the hoods at each end with pneumatic sanders.

AIR BRAKES AND ELECTRICAL EQUIPMENT

The air-brake equipment includes two D-4K Westinghouse-driven compressors. Each of the D-4L compressors has a displacement capacity of approximately 50 cu. ft. of free air per minute. The dynamotor for operating each air compressor runs constantly, while the friction clutch, which is pneumatically operated and controlled by the main reservoir pressure, will cut in the compressor whenever necessary to maintain a predetermined pressure in the main reservoir. Each dynamotor consists of two sets of armature and field windings which are mounted respectively in the same slots and upon the same poles. When the locomotive is operated on 1200 volts, the two windings are connected in series, and current for the lights and controller apparatus is tapped midway between the two, providing a difference of potential of 600 volts to ground. When operating on 600 volts one set of the armature and field coils will be cut out and the remaining set will operate as in a series motor.

Four Westinghouse No. 308-D3 motors drive each of the locomotives. Each axle is equipped with an independent geared motor, the motor weight being partially carried by two axle bearings and the remainder supported by the nose resting directly on the truck bolster. The No. 308-D3 motor has the same general characteristics as the standard 308-B, 600-volt motor, but is insulated for 1500 volts. Its normal rating with natural ventilation is 225 hp at 600



Longitudinal and Cross Sections of Southern Pacific Locomotive

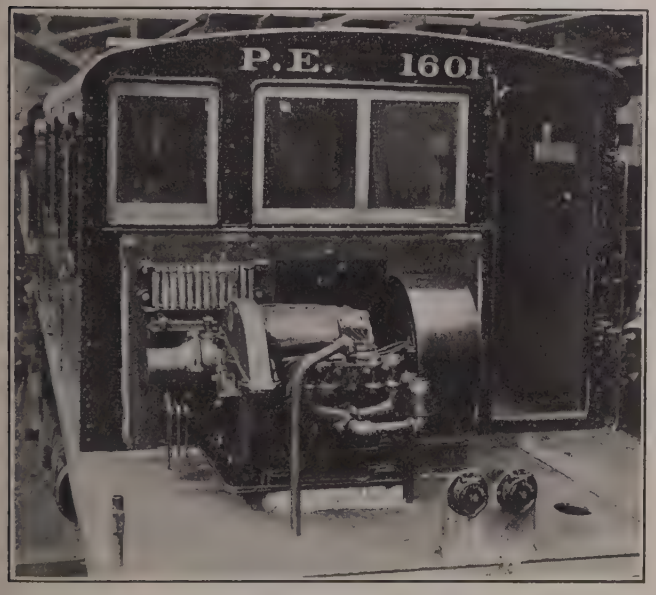
Side View of Southern Pacific Locomotive

volts. With forced ventilation the rating of the motor is 250 hp at 600 volts. The motors have commutating poles.

The unit-switch type HL control, which is used, provides for three running positions for 600 volts and two for 1200 volts and 1500 volts. To give the three running positions a pneumatically operated series-parallel switch has been installed. This switch can be operated by a control switch from either end of the cab and is so connected that the two motors comprising each pair may be arranged in series or parallel with each other at the will of the operator. An interlocking arrangement has been provided to render it impossible to operate the series-parallel switch except when the circuit on the main motor is opened.

There are eleven notches on the master controller with the motors in full series, nine notches with the motors in series parallel and nine notches with the motors in full parallel. On 1200 volts the motors are operated only in full series and in series parallel.

Two hand-operated, drum-type switches, whereby a change-over from 600 volts to 1200 volts can be effected, have been installed in the cab. Each of these change-over switches simultaneously readjusts the divisions in the main resistance, connects the two dynamotors for 1200-volt operation and locks the series-parallel switch in the series position. The same number of notches are available on the master controller for 1200-volt operation as for 600-volt operation for full-series or series-parallel positions. Each locomotive is equipped with train-line receptacles and jumpers so that any number of engines can be controlled in tandem by one operator.



Dynamotor, Compressor and Fan

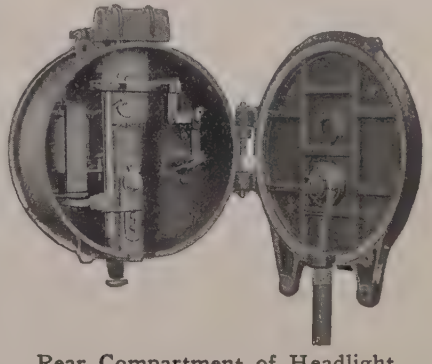
In addition to the line switches, reverser, master controller and other standard HL control, a relay has been provided which will open all the circuits of the motors whenever the trolley passes specially arranged aerial brush contactors, one of which is mounted on each side of every trolley wire section insulator. This device insures that there can be no current through the motors when the trolley passes the section insulator. To set the relay and thereby remake the control circuit it is necessary first to bring the master controller to the "off" position. An overspeed relay is also provided to open the main motor circuit when the armature speed exceeds a safe limit.

A warning signal is located in the locomotive cab. It notifies the motorman of any open circuit which may be due to the action of the overload trip, to the blowing of the main fuse or to the trolley leaving the wire. This feature is of particular importance when two locomotives are being operated in tandem as with it the operator will be notified should the main circuit on the rear locomotive be opened accidentally.

Two fans for supplying forced ventilation to the main motors are mounted on the extended shafts of the two dynamotors, and in addition to their function of supplying cooling air serve as a light load to limit the speed of the dynamotors when the compressors are not in service. With natural ventilation the motors and auxiliary apparatus on each locomotive have sufficient capacity to enable it to exert continuously a tractive effort of 5600 lb. With blowers in operation the locomotive will exert continuously a tractive effort of 11,500 lb., and for a period of one hour a tractive effort of 21,600 lb. at a speed of 17.6 m.p.h. with 600 volts at the motors. With clean, dry rails the locomotive can exert a momentarily tractive effort of 30,000 lb.

LUMINOUS-ARC HEADLIGHT

In response to the demand for an arc headlight of comparatively low wattage consumption for city and suburban service, the General Electric Company has brought out a new luminous-arc headlight of moderate capacity. Better illumination of city and suburban thoroughfares by modern street-lighting systems, objection to intense concentration in the projection of light when traversing densely populated districts and low-speed requirements of suburban service are factors that have induced the development of an illuminant of greater strength than the ordinary incandescent headlight but of less penetrative power than the standard arc headlight for interurban cars. The new luminous-arc headlight, operating on 2 amp and 80 volts at the arc, is designed for such service.



Rear Compartment of Headlight

This lamp utilizes the well-known luminous arc, which emits a brilliant, steady, white light and will throw a concentrated beam a distance of 600 ft. to 800 ft.. It occupies about half the space and weighs about half of the interurban type of lamp. A novel and superior method of ventilation is provided. A baffled intake and draft cap prevent accumulations of fume deposits on the lens or mechanism. The unit is composed of a two-compartment casting, the two chambers being separate and hermetically sealed from each other by a central partition.

The two-compartment design affords several advantages. The operating mechanism being separated from the arc is protected from intense heat and gases. The resulting comparatively low temperature of the moving parts prevents expansion of the metal and eliminates danger of injury to the windings from heat radiation. The segregation of the electrode mechanism allows thorough expulsion of the fumes through draft ventilation. Access to the mechanism by incompetent persons is prevented. The iron partition forms a perfect shield and precludes any magnetic leakage that might otherwise affect the luminous arc.

The forward compartment, which contains the electrode mechanism, is provided with a cast-iron door holding a standard 8⅜-in. semaphore lens, to all practical purposes indestructible. This door is hinged at the top and has a catch at the bottom for locking it securely. The

upper positive electrode consists of a solid adjustable copper rod, while the lower negative electrode is composed of a rolled sheet-iron tube with welded seam, containing the standard mixture used in series luminous lamps for street-lighting systems. The electrodes possess the same desirable, long-burning characteristics as those employed in 4-amp., interurban-type lamps.

The lower electrode is grasped firmly in a cast movable holder, which is mechanically connected to a shaft extending through the central partition of the casing. The shaft is in turn actuated by a clutch mechanism in the rear compartment and is designed to strike an arc of fixed length. The rear compartment also contains a single solenoid, operating an armature connected with a substantial clutch, which controls the clutch mechanism. Feeding the electrodes is automatic and is occasioned by the ordinary interruptions of the trolley circuit incidental to regular operation.

A hinged rear door is provided, which permits of easy access to the mechanism for such adjustments as may be necessary. In regular service the main casing is screwed to this door, thus preventing tampering with the mechanism by persons not regularly authorized to do so. The rear door also carries a single spring contact, making connection with a single positive lead. The negative side of the lamp is grounded to the casing.

The lamp is furnished in a stationary type for permanent installation at either end of the car, or in a portable type which may be shifted from one end to the other. If desired, lamps can be supplied with a ½-in. conduit for the positive lead with plug attached, or the conduit

Luminous-Arc Headlight, Open and Closed

may be dispensed with and the lead brought directly to the contact spring, entering the casing through a compound bushing at the bottom of the rear door. The moderate depth of casing of the lamp insures protection in case of collision, as it is shielded by the bumpers on the cars. The headlight operates on a 550-volt direct-current circuit with steadying resistance, but special resistances can be furnished for operation on 220-volt to 1200-volt circuits.

Four new cars which embody unusual features have been received by the Nashville & Gallatin Interurban Railway Company, Nashville, Tenn., from the American Car Company, St. Louis, Mo. The cars are 56 ft. in length and accommodate more than eighty passengers. They are of the pay-as-you-enter type, with a commodious back platform three steps above the street level, equipped with folding stools for the accommodation of smokers and those who prefer to ride in the open air. "Jim Crow" compartments, wash-rooms and stationary water coolers are features of the cars. The motors are wound for 600-volt or 1250-volt operation. The cars are now at the carhouse of the company receiving their final inspection preparatory to being placed in operation between Nashville and Gallatin.

THERMOSTAT FOR ELECTRIC HEATERS

The thermostat which was introduced by the Consolidated Car Heating Company, New York, as an automatic regulating switch for electric heaters is now being adopted so extensively that the following particulars of its construction and operation should be of timely interest.

The thermostat with case is shown in Fig. 1, and Fig. 2 shows the thermostat without case. The extreme simplicity

Fig. 1—Thermostat with Case

Fig. 2—Thermostat without Case

of the thermostat is apparent from the fact that the only moving part is the arm which moves between the fixed contacts on the bottom of the small magnets. The inverted "V" at the top, which constitutes the thermostat element, is the result of years of experimenting with thermostatic metals. Only one adjustment is required on the thermostat, as the contacts at the bottom are fixed for a 5-deg. range. This adjustment is from 40 deg. to 45 deg. or as high as 80 deg. to 85 deg., and even 100 deg. if it is used in armature ovens and other surroundings of that nature.

The magnetic switch which the thermostat controls is illustrated in Fig. 3. The switch is shown in the "on" position, but the phantom shows the switch in the "off" position. This switch can be placed under a seat or can be hung underneath the car. No resistances are used, as the control current going directly through the coil in the switch ceases to flow as soon as the switch reaches full "on" or "off" position. This is accomplished by use of the tripper switch,

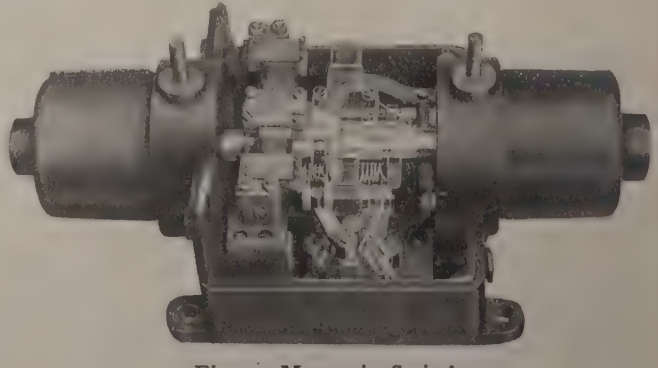


Fig. 3—Magnetic Switch

shown in the bottom of Fig. 3, which opens the control circuit just at the last instant of travel. Any overheating of any part of the apparatus is therefore avoided. The main heater switch is provided with a magnetic blowout and is very substantially constructed. About 1500 equipments of this apparatus are now operating on various roads throughout the country.

A PORTABLE ELECTRIC WELDING OUTFIT

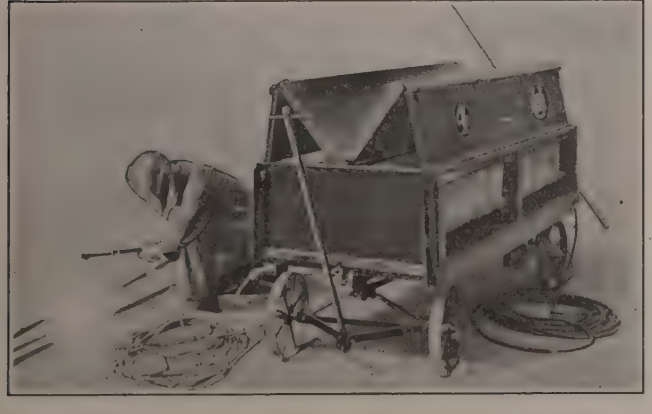
The Indianapolis Switch & Frog Company has been demonstrating on the Chicago City Railways during the early part of this week an electric-arc welding device for rail joints and compromise splices. As shown in the accompanying illustration, the outfit for rail welding is a portable machine mounted on truck wheels so that it can be drawn to any desired location independent of the tracks. It consists substantially of a ventilated rheostat with the proper means for a voltage control, and a hooked pole connection for making contact with the control wire, current being utilized at voltages between 500 and 600. This arrangement avoids delays to passing cars and permits regular operation to be carried on simultaneously with the track repairs.

Portable Electric Welding Outfit for Repair Shop Use, with Sample Axle, Gear Cases, etc.

The device in addition to making continuous welded track joints, which require no bonds or bolts and have a conductivity 40 per cent greater than the unbroken rail, is capable of building up low joints, cupped-out rails and worn or guttered special work. It can be operated by ordinary laborers after a short period of instruction, and when used for building up worn pieces feeding points made of steel with any desired composition are used.

When the outfit is not in use on rail welding or repairing it is available for use in the shop or power house, an illustration for the equipment which can be furnished for shop use being shown in the accompanying illustration.

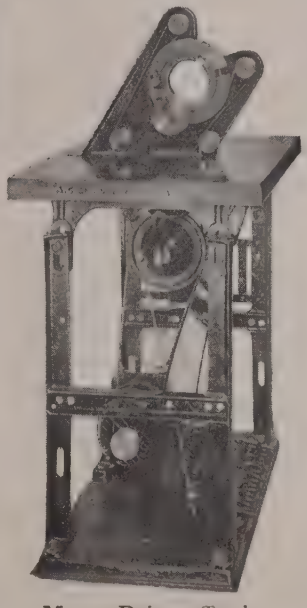
The United Railroads of San Francisco keep a number of these outfits in constant operation and are reported to have effected very large savings through their use. The Los Angeles Railroad Comporation and the Pacific Electric Railroad of Los Angeles also use the machines extensively. With new machines demonstrators are furnished if desired for the purpose of instructing the operators in the most efficient methods for its use. The makers, however, also contract for making electric welds themselves when such an arrangement is desired, and, of course, make demonstrations on roads where the capabilities of the machines are not realized. One of these convenient welding equipments will be in continuous operation during the Chicago convention.



Portable Electric Welding Outfit Applied on Rail Joints by One Man

MOTOR-DRIVEN PORTABLE ARMATURE TAPING MACHINE WITH ADJUSTABLE TABLE

The new A. G. E. taping machine manufactured by the American General Engineering Company, New York, is shown in the accompanying cut. The operating parts are constructed of bronze and the taping head containing the spindles is mounted on a wooden table supported by iron legs which are fastened to an iron base, making the machine rigid in operation. The table is 24 in. long x 22 in. wide, and its normal height is 31¾ in. with an adjustment of 3½ in. upward, a feature which is of great value for taking up the slack of the belt. The countershaft is hung on the bottom of the table and the motor is fastened to the base to make a very compact machine which requires less than 4 sq. ft. of space. The power is transmitted from the motor to the countershaft and from the countershaft to the taping spindle by means of a round leather belt which passes through the table and is guided by small pulleys or an idler. The roll of tape is fastened to the taping spindle which revolves in the center of the head. The tension on the tape is taken up by an adjustable screw-spring bearing on the outside flange against the side of the tape. The motor is fitted with a cut-out and starting box mounted on the leg of the table which can be reached by the operator without changing his position. The machine has no back lash and will make a positive stop when the treadle is released by the foot of the operator. Among the novel features of this machine are its portability and compactness combined with efficiency due to the use of motor drive and to the operator's control of the machine by the pedal.



Motor-Driven Taping Machine

TEMPORARY INJUNCTION GRANTED IN MILWAUKEE FARE CASE

A temporary injunction was granted by Judge Stevens, of the Dane County Circuit Court, Milwaukee, on Sept. 20 on application of The Milwaukee Electric Railway & Light Company to restrain the enforcement of the order of the Railroad Commission of Wisconsin for the establishment of a lower ticket rate of fare. An abstract of this order was published in the Electric Railway Journal of Aug. 31, 1912, page 314. The court ordered the company to issue certificates with each sale of tickets from Sept. 23 so that passengers would be able to secure the rate ordered if the decision of the commission in the case should be upheld finally by the courts. The order of the commission fixed Sept. 23 as the time when the rate of thirteen tickets for 50 cents should be established.

LONDON LETTER

(From Our Regular Correspondent)

The Glasgow Subway, an old tube which operates one circle in Glasgow on the cable system, has for many years been far from successful. The chairman of the company pointed out recently to the shareholders that the action of the Glasgow Corporation Tramways in extending its half-penny stage had dealt a most serious blow to the subway. There have been offers from syndicates to electrify the subway, but no definite arrangements to this end have ever been made.

The city of Birmingham, like London, is seriously concerned about the future of the corporation tramways. There is a growing opposition to any extension of the overhead system in view of the success with which motor omnibuses are meeting. At a recent meeting of the Birmingham Chamber of Commerce the imperial and local finance committee presented a report in which it stated that it had considered the proposed extension of the electric tramways which involved a heavy additional capital outlay, and it recommended the City Council to reconsider this proposal. The committee favors a preliminary trial with motor omnibuses as a practical alternative method. Property owners along the proposed route of the extension signed a petition against the construction of tramways.

The Dudley Town Council has decided to sell the electrical undertaking, which supplies the tramways and the public and private lighting, to a company which has agreed to guarantee the payment of principal and interest on the loans and to charge not more than the present rates for electricity. The plant cost £98,000 and was opened in 1899. The Council is now confronted with an annual loss of £1,000, partly through the result of an arbitration regarding charges for current to the tramways and partly through the plant becoming obsolete. It is understood that the offer of purchase emanated from the British Electric Traction Company and that the Birmingham & Midland Tramway and the Shropshire Power Corporation are interested in the purchase.

The honor of introducing the trackless trolley to Scotland has fallen to Dundee. The system installed there is that of the R. E. T. Construction Company, London, which has also installed systems at Bradford and Leeds. It is 1¼ miles long and was equipped at a cost, exclusive of the cars, of about £1,250. The cars are geared for a speed of 14 m.p.h. At present only two cars are in use. They weigh about 3½ tons each and are constructed on the bus principle. Accommodation is provided for twenty-eight passengers. Each car is equipped with two brakes.

The electrification of the East London Railway is approaching completion, and the service of electric trains has been decided upon. These trains will be provided and operated by the Metropolitan Railway on behalf of the East London joint committee. There will be a thorough service of four trams an hour from the western terminus of the Metropolitan system over the whole Metropolitan system by way of Aldgate and Whitechapel and so by the new electrified East London line to the terminus at New Cross. As two main railways have stations at New Cross, these trains will be run alternately into the London, Brighton & South Coast and the South Eastern stations. The whole of the north and west of London, including the terminals of all the big northern railways, will therefore be brought into communication with the East London line and the south-eastern suburbs by way of the new line at New Cross. In addition there will be a service of eight local trains an hour between Shoreditch and New Cross running alternately into the Brighton and the South-Eastern stations. The District Railway will also profit by the new electrification, as its system will connect with the new line at Whitechapel or Aldgate East. The new electrified line will pass through the old Thames Tunnel between Wapping and Rotherhithe. This tunnel was constructed for foot passengers, but was never popular as it was not properly ventilated. The line is being overhauled and automatic signaling installed and the stations renovated and modernized. The property has not been successful financially with steam as motive power.

Two trains on the Great Northern, Piccadilly & Brompton tube collided recently at the Caledonian Road station. It is the custom for trains to stop at alternate stations, and on this occasion a train which was scheduled not to stop at Caledonian Road station ran into the rear of a train which was standing in the station longer than usual. The oncoming train overran the automatic stop. Immediately after the accident all of the apparatus was tested and it appeared to be in perfect working order, so that the real cause of the accident has not been ascertained. No one was seriously hurt.

The fight for traffic in London gets keener every day, and the newspapers contain many statements about the decadent tramways. Some of the criticisms are undoubtedly political, while others perhaps are instigated by motor interests. Unfortunately for the tramway interest, some of the statements are undoubtedly true, as is shown by published statistics. It is claimed, for instance, that the London County Council Tramways shows a decrease of £48,000 for the past twenty-three weeks, whereas the London General Omnibus Company reports an increase of £514,000 for a period of forty-eight weeks. While this is true, it is also true that the period of twenty-three weeks was picked from the worst of a wet summer and that over forty-eight weeks the actual decrease is only about £5,000. The vital question, however, is how the London County Council Tramways are to meet the severe competition of the omnibus lines. The petrol buses of London afford a comfortable and convenient mode of transport, and have an advantage over the tramway on account of the flexibility of their route. The tramways are also at a disadvantage because they have been unable to get through routes in London. There are no tramways in the main arteries of the West End of London or through the city. The tramway routes, with the exception of the one on the embankment, terminate short of where people want to go, whereas the motor omnibuses operate through the shopping districts of Regent Street, the Strand, Fleet Street and Holborn. It is urged that no more capital should be put into tramways. The tramways pay a considerable sum for the upkeep of the streets on which they run, whereas the buses pay a tax of £40 per car to the Road Board, which has the privilege of spending the money elsewhere than in London. Now that the London General Omnibus Company is controlled by the Underground Railways of London, the competition will be still more severe as the company intends to put on many more omnibuses. It is hoped that the use of trail cars will improve the receipts of the County Council tramways.

In this connection it is interesting to note that the Metropolitan Electric Tramway, an independent company which operates in the northern suburbs of London, has ordered 300 motor omnibuses to operate in the suburbs and to act as feeders to its tramway system.

In another paragraph reference is made to Birmingham's action in regard to "the probable prospective obsolescence of the present system of overhead tramways," and it may be mentioned that Croydon has become alarmed at the competition of the motor omnibus and at the next session of Parliament will ask for powers to run motor omnibuses. In the meantime the tramways committee is placarding the streets with appeals to the ratepayers to support the tramways, which show a decrease in gross receipts of about £1,000 for five months. A conference was held at Richmond of the local authorities which have jurisdiction over the roads in and around London, and the question of taking combined action to regulate heavy motor traffic and tax motor omnibuses was discussed. Omnibus companies pay nothing to the local rates, it is urged, and often compete with the local tramways. In regard to this competition, it is significant that in two years the London General Omnibus Company has reduced its operating expenses by 3½d. per omnibus mile, while in the same period the London County Council has reduced its operating expenses by about ½d. per car mile.

In the meantime the London County Council has decided to renew in the next session of Parliament the application for authority to extend the existing tramways in Farringdon Street as far as Ludgate Circus. Plans have also been submitted to the Corporation which show the system of electric traction and mode of construction proposed for the extension of the tramways from the City boundary through Bishopsgate to Liverpool Street.

A. C. S.

News of Electric Railways

Strike in Augusta

The conductors and motormen in the employ of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., who are members of the union organized among the employees of the company, went on strike on Sept. 23, 1912, at noon to enforce demands which they had made upon the company, which demands had been considered at conferences between the management and the men extending over more than a week. E. C. Deal, general manager of the company, reviewed the situation in part as follows in a communication which he addressed to the public on Sept. 23, 1912:

"The representatives of the union called upon General Manager Deal last week and advised him that the members of the union would not work with the non-union men. Various conferences had been held between the officials of the company, the representatives of the union and the representatives of the non-union men, and every conceivable suggestion has been made by the officials of the company in an attempt to smooth out the differences between the union and non-union men.

"The union, through a bulletin posted at the office of the company, invited the non-union men to join the union, and the non-union men by a similar bulletin, posted at 9:30 o'clock this morning, respectfully declined. Still another attempt on the part of the officials to straighten out the differences between the men was made this morning, but without avail.

"The officials of the company have refused at all times to force the non-union men to join the union and have refused to discharge the non-union men because they would not join the union.

"We regret that cessation of street car service has occurred on account of the union trainmen leaving their cars, but the company will take prompt measures to restore service as quickly as possible."

When the strike was called Mayor Barrett was asked by the company to protect its property. He replied that he would not furnish police on the cars unless it became necessary. The first car that left the carhouse was attacked at the Monument on Broad Street, and the police had to disperse the mob. A committee representing the labor interests in Augusta waited upon the Mayor and asked that the police be removed from the cars, but as they could only guarantee that the men whom they represented would not molest the carmen the Mayor declined to remove the officers from the car. The Mayor called a conference at his house on Sept. 26, 1912, between J. H. Pardee, vice-president of the company, and one of the representatives of the employees. This conference was in progress when it was reported that a mob had attacked the power plant on Fifteenth Street. Negotiations looking to a settlement of the trouble were then discontinued and have not been resumed. After the mob had attacked the power plant, the Mayor asked Chief of Police Elliott if he could handle the situation, and upon being informed that he could not the Mayor asked the Governor for the troops. Mayor Barrett concluded as follows his remarks to the Council on Sept. 28, 1912:

"No one in Augusta regrets the unfortunate occurrence any more than myself, but if the same conditions presented themselves again I would call out the militia. When I took the oath of office I swore that I would protect the life and property of the citizens of Augusta, and, so help me God, I intend to do so, whether it be the life and property of the poorest man in the city or the most powerful corporation. They will all find me looking after their interests to the very best of my ability as long as I am in office."

Late on the night of Sept. 27, 1912, Governor Brown of Georgia issued a proclamation declaring "the city of Augusta to be in a state of insurrection" and ordering the immediate enforcement of martial law. One person was killed and two were shot when members of the mob that had been threatening the power plant of the company broke through the dead line established by the militia.

A special meeting of the City Council was held at 4 p. m. on Sept. 29, 1912, and resolutions were offered calling upon the company to submit to arbitration the differences between the company and the striking carmen. The resolutions were unanimously passed, and a committee of councilmen was appointed to present the matter to the management of the company. The committee presented the resolutions to Mr. Pardee and Mr. Deal, but at an early hour on Sept. 29 the officials stated that they would hardly be able to make an answer before Sept. 30. The resolution which was passed by the City Council follows:

"Be it resolved, That the City Council, in chambers assembled, request and urge that the Augusta-Aiken Railway & Electric Corporation submit the differences now existing between the carmen and the company to arbitration without delay, as has been requested by the Chamber of Commerce and other commercial bodies, and has been agreed to by the Amalgamated Association, believing this to be the only means now at hand by which a permanent settlement can be attained."

Incorporation of New York Municipal Railway Corporation

The Brooklyn Rapid Transit interests filed on Sept. 27, 1912, in the office of the Secretary of State in Albany the certificate of incorporation for the new company which is to operate the Brooklyn Rapid Transit Company's share of the enlarged rapid transit system of the city and to construct and own such parts of it as are designed for private ownership. The new company will be known as the New York Municipal Railway Corporation, and its capital is fixed at $2,000,000. With the certificate of incorporation was filed a certificate from the Public Service Commission approving the formation of the new company, signed by Travis H. Whitney, secretary. The incorporators of the new company are Anthony N. Brady, J. Horace Harding, Walter C. Oakman, Colonel Timothy S. Williams, James H. Wallace, Bernard Gallagher, Charles A. Boody, Charles D. Meneely, George D. Yeomans, Arthur King Wood, C. D. Burdick, John W. Weber, George W. Davison, John F. Grier and James C. Brady. The directors of the new corporation are Anthony N. Brady, J. Horace Harding, Walter G. Oakman, Colonel Timothy S. Williams, John F. Grier, Charles A. Boody, John Englis, James C. Brady, Arthur King Wood, Clinton D. Burdick, John W. Weber, George Davison and George D. Yeomans. Of these Colonel Timothy S. Williams is president and George D. Yeomans counsel of the Brooklyn Rapid Transit Company, and Anthony N. Brady, J. Horace Harding, Walter G. Oakman and George Davison are directors of the Brooklyn Rapid Transit Company. Of the others, Charles A. Boody is a director of the Brooklyn Union Elevated Railroad, Arthur King Wood is president of the Franklin Trust Company, Clinton D. Burdick is third vice-president and treasurer of the Title Guarantee & Trust Company, and John W. Weber is vice-president of the First National Bank of Brooklyn.

Renewal of Negotiations Between Company and City Urged in San Francisco

In a communication addressed, on Sept. 21, 1912, to the Board of Supervisors of San Francisco, Cal., the United Railroads urged a renewal of negotiations to bring about the dismissal of all pending litigation between the company and the city, provide for the joint use of poles and tracks in lower Market Street by the United Railroads and the Geary Street, Park & Ocean Municipal Railroad and make possible the extension of the Geary Street road to the ferry without further legal contest. The company called attention to the proposals and counter proposals exchanged between it and the city last June and said that while it is ready to accede to the propositions as finally outlined, it has not as yet received an answer from the city. These are the proposals to which the company is willing to agree:

"The city to construct its municipal railway in Market

Street from Kearny to Sutter Street, there connecting with the outer tracks constructed by the Sutter Street Railway.

"The use of the outer tracks from Sutter Street along Market Street to the ferry to be limited exclusively to the cars of the municipal railway and the Sutter Street cars.

"The city to pay its share of the fair present value of the tracks and overhead equipment of the Sutter Street Railway, excepting the poles, such shares to be proportioned by the use of the respective parties; the amount to be thus paid was to be agreed upon between the parties or by arbitration.

"The use of the outer tracks in Market Street from Sutter Street to the ferry, to terminate with the expiration of the Sutter Street franchise, at which date the reasonable salvage value of the property was to be paid to the company.

"The city to have the right to use the poles of the United Railroads in Market Street from Kearny Street to the ferry without charge.

"The electric current used in the operation of the lines in Market Street from Sutter Street to the ferry to be paid for in proportion to the use by the respective parties.

"All litigation pending to be dismissed and transfers to be exchanged under proper restrictions at the intersection of Geary Street with the Devisadero and Fillmore Street lines of this company."

The company concluded the communication as follows:

"Your honorable board is, under the charter, vested with the power to accept or reject the suggestions here made, and we submit them for your consideration. If you cannot co-operate with the company in the matter herein suggested we think it but fair to say that we shall be compelled to take such steps to protect our legal rights as we may be advised and to prosecute the same as expeditiously as possible."

New Pennsylvania Railroad Development in New York

The Pennsylvania Terminal Real Estate Company of Manhattan was incorporated on Sept. 28, 1912, at Albany, N. Y., with a capital of $3,000,000. Its board of directors consists of Pennsylvania Railroad officials and its charter purposes are the same as those of other realty companies in New York City. Samuel Rea, vice-president of the Pennsylvania Railroad and one of the directors of the new company, said that it was formed to develop the property of the Pennsylvania Tunnel & Terminal Railroad Company adjoining the Pennsylvania Station, and that when full plans had been adopted by the president and board of directors they would be made public. He also said that the inducement now to proceed with these improvements was the adoption by New York City of its subway plans. This meant rapid transit for the West Side and for the Thirty-fourth Street, Herald Square and Pennsylvania Station districts. With regard to the rapid transit situation, Mr. Rea is reported to have said that the company relied principally upon the Seventh Avenue West Side line and the Broadway subway.

Extension of Time in Hally Ordinance Case in Detroit

Judge Tuttle, of the United States District Court, at Detroit, has granted the Detroit (Mich.) United Railway an extension of two months in which to submit testimony in the Hally ordinance case. The request was not opposed by the city's attorneys.

For evidence as to the original cost of the 3-cent lines in Detroit the city's attorneys have referred to the report made by the Secretary of State in 1895. This showed the approximate cost to be $43,973 per mile, or a total of $1,930,814 for the 43¼ miles. The appraisal of Mr. Rifenberick, engineer for the company, gives the reproduction value of the same lines, with such improvements and extensions as have been made, at $6,000,000. The city is trying to show that the additions for engineering, financing and overhead charges in general are excessive. Mr. Rifenberick has been requested to show in detail the exact additions made to the first cost.

Franchise Declared Forfeited in Lafayette, Ind.—The City Council of Lafayette has passed an ordinance declaring the franchise of the Fort Wayne & Northern Indiana Traction Company over certain streets forfeited and has ordered that the tracks be removed.

Franchise for Relief Line in Los Angeles Ordered Sold.—The City Council of Los Angeles, Cal., has decided to advertise for sale a street railroad franchise on San Pedro Street from Aliso Street to Ninth Street. The bids will be opened Oct. 8. The Pacific Electric Railway desires this franchise for the purpose of constructing a line to lessen the traffic congestion on Main Street.

Request for Hearing on Rail Question Withdrawn.—The Connecticut Company has withdrawn its request to the Public Utilities Commission of Connecticut to hold a public hearing in Bridgeport in regard to the application of the company for permission to substitute T-rails for girder rails in reconstructing its lines in Fairfield Avenue, Bridgeport. The hearing was set for Sept. 23, 1912.

New Subway Ordinance in Pittsburgh.—A new subway ordinance has been introduced in the Council of Pittsburgh at the request of A. E. Anderson, president of the Painter's Run Railway. On the other hand, the Rapid Transit Subway Company has objected to the general ordinances to govern subways. The new ordinance of the Painter's Run Railway was made necessary by the change in the title of the company. It will be called hereafter the Pittsburgh District Railroad.

Appeal from Order of Ontario Railway & Municipal Board.—The city of Toronto has been granted the right to appeal from the order of the Ontario Railway & Municipal Board giving the Toronto & York Radial Railway permission to divert its line from Yonge Street at Farnham Avenue. I. S. Fairty, for the city, said that the city will contend that the company had no legal right to make the deviation. The court was prompted to grant the company permission to make the change because five public highways were affected.

Funds Asked for Preliminary Work on Proposed Municipal Line at Los Angeles.—By resolution the Municipal Railway Commission of Los Angeles, Cal., has asked the Council to authorize the Board of Public Works to use the $5000 provided in the budget for such expenditures as may be necessary to commence the work of constructing the proposed municipal railroad, and such other expenditures as may be required for furthering the construction of the road. The commission has also declared that, inasmuch as the construction of the municipal railroad is about to be commenced, it is opposed to the granting of a franchise on San Pedro Street to the Pacific Electric Railway.

Conferences in Regard to New York Subway Operating Contracts.—The members of the Public Service Commission of the First District of New York have been conferring with representatives of the Interborough Rapid Transit Company and of the Brooklyn Rapid Transit Company over the proposed contracts for construction and operation of the dual system of rapid transit lines. These contracts are for the purpose of putting into effect the agreement reached between the city and the operating companies by which the latter are to furnish some of the funds needed for construction and all of the funds necessary for reconstruction and elevated extensions and concerning the terms upon which each company will operate the new lines when built. As soon as these conferences have been concluded the commission will put the contracts into permanent form and hold a public hearing upon them. The Public Service Commission of the First District of New York has executed two contracts with F. L. Cranford, Brooklyn, N. Y., for the construction of Sections Nos. 1 and 1-A of the Broadway Subway in Manhattan, to be operated by the New York Municipal Railway Corporation, organized in the interest of the Brooklyn Rapid Transit Company. Section No. 1 runs from Trinity Place and Morris Street, Manhattan, up Trinity Place and Church Street to about Dey Street, and Section No. 1-A from that point up Church Street, Vesey Street and Broadway to Park Place. This will be a two-track subway. The contract price for Section No. 1 is $1,222,269, and for Section No. 1-A, $982,740. Instead of filing a bond, Mr. Cranford deposited corporate stock of the City of New York in the sum of $125,000 as a guarantee of the faithful performance of the contract.

Financial and Corporate

Stock and Money Markets

Oct. 30, 1912.

Prices yielded on the Stock Exchange to-day to the pressure of profit-taking sales, which were larger than any since the recent upward movement began. Before the selling began, however, new high averages for the year were established in the industrial and the railroad issues. In the money market rates on call loans rose to 7½ per cent, the highest rate which has been quoted so far this year. The renewal rate of 6¼ per cent was also the highest which has been reached this year. Rates in the money market to-day were: Call, 6@7¼ per cent; sixty days, 5¾ @6 per cent; six months, 5½@5¾ per cent.

The market for stocks in Philadelphia broadened to-day. The Lehigh Valley Transit issues were in demand, as were also the York Railways preferred. The local tractions were inactive.

In Boston the tone of the market was strong for nearly all the session. Near the close, however, the market was less active.

The Chicago market was narrow and inactive. The local traction issues were not much in evidence in the trading.

In the Baltimore market trading was also very narrow. The market for bonds continued good, however, with the public service issues in demand.

Quotations of traction and manufacturing securities as compared with last week follow:

	Sept. 25.	Oct. 1.
American Brake Shoe & Foundry (common)	a99½	a99½
American Brake Shoe & Foundry (preferred)	157	145
American Cities Company (common)	31¼	a32
American Cities Company (preferred)	77⅜	77½
American Light & Traction Company (common)	*428	430
American Light & Traction Company (preferred)	a112	a113
American Railways Company	a46½	a45⅜
Aurora, Elgin & Chicago Railroad (common)	a46	a46
Aurora, Elgin & Chicago Railroad (preferred)	a88	85½
Boston Elevated Railway	a125	124
Boston Suburban Electric Companies (common)	a15	a15
Boston Suburban Electric Companies (preferred)	a78	a78
Boston & Worcester Electric Companies (common)	*10	*10
Boston & Worcester Electric Companies (preferred)	a53	a53
Brooklyn Rapid Transit Company	91⅜	91
Capital Traction Company, Washington	*126	*126
Chicago City Railway	a157	a170
Chicago Elevated Railways (common)	a35	a35
Chicago Elevated Railways (preferred)	a92	a92
Chicago Railways, ptcptg., ctf. 1	a90	a90
Chicago Railways, ptcptg., ctf. 2	a23½	a24½
Chicago Railways, ptcptg., ctf. 3	a9	a8½
Chicago Railways, ptcptg., ctf. 4	a4¼	a4
Cincinnati Street Railway	a130	a129½
Cleveland Railway	a105	a106¼
Cleveland, Southwestern & Columbus Ry. (common)	*7	*7
Cleveland, Southwestern & Columbus Ry. (preferred)	*34	*34
Columbus Railway & Light Company	a55	a55
Columbus Railway (common)	a70	a70
Columbus Railway (preferred)	a90	a90
Denver & Northwestern Railway	*125	*125
Detroit United Railway	70	70
General Electric Company	183¼	183¾
Georgia Railway & Electric Company (common)	124½	a124½
Georgia Railway & Electric Company (preferred)	a85	a85
Interborough Metropolitan Company (common)	20⅛	20⅛
Interborough Metropolitan Company (preferred)	60¾	60⅛
International Traction Co., Buffalo, 4% bonds rcts	*75	*75
Kansas City Railway & Light Company (common)	a22	22
Kansas City Railway & Light Company (preferred)	a45	a42
Lake Shore Electric Railway (common)	*8½	*8½
Lake Shore Electric Railway (1st preferred)	*93	*93
Lake Shore Electric Railway (2d preferred)	a28	*28
Manhattan Railway	a133½	a134
Massachusetts Electric Companies (common)	a19¼	a20¼
Massachusetts Electric Companies (preferred)	a79	a79½
Milwaukee Electric Railway & Light (preferred)	102	*102
Norfolk Railway & Light Company	*28	*28
North American Company	85¼	85
Northern Ohio Light & Traction Company (common)	a70	a70
Northern Ohio Light & Traction Company (preferred)	a105	a105
Philadelphia Company, Pittsburgh (common)	a52½	a52⅝
Philadelphia Company, Pittsburgh (preferred)	a44½	a44½
Philadelphia Rapid Transit Company	a28½	28
Portland Railway, Light & Power Company	66	66
Public Service Corporation	a120	a120
Third Avenue Railway, New York	36¾	36½
Toledo Railway & Light Company	a8¾	a8¾
Twin City Rapid Transit Co., Minneapolis (common)	a109¾	a107½
Union Traction Company of Indiana (common)	14	*14
Union Traction Company of Indiana (1st preferred)	88	*88
Union Traction Company of Indiana (2d preferred)	*40	*40
United Rys. & Electric Company (Baltimore)	*25¾	a26¼
United Rys. Inv. Company (common)	a33	32⅛
United Rys. Inv. Company (preferred)	a61¾	a61
Virginia Railway & Power Company (common)	*50½	50¼
Virginia Railway & Power Company (preferred)	a87½	a87½
Washington Ry. & Electric Company (common)	*93¼	*93¼
Washington Ry. & Electric Company (preferred)	*96¼	*96¼
West End Street Railway, Boston (common)	a82¼	a82
West End Street Railway, Boston (preferred)	a98½	*98½
Westinghouse Elec. & Mfg. Company	85½	86
Westinghouse Elec. & Mfg. Company (1st preferred)	a130	a124

* Last sale. a Asked.

ANNUAL REPORTS

Fonda, Johnstown & Gloversville Railroad

The annual report of the Fonda, Johnstown & Gloversville Railroad for the fiscal year ended June 30, 1912, shows the following results as compared with previous years:

	1912.	1911.	1910.
Railway Operating Revenue:			
Miles operated	88.26	86.35	86.35
Freight revenue	$245,432	$261,180	$247,364
Passenger revenue, steam division	69,366	71,462	68,653
Passenger revenue, electric division	565,837	560,881	534,665
Mail revenue	3,147	3,151	3,149
Express revenue	17,085	17,553	17,950
All other revenues from transportation	6,553	6,540	7,088
Revenue from operation other than transportation	24,747	25,599	25,882
Total operating revenue	$932,167	$946,366	$904,751
Railway Operating Expenses:			
Per cent.	49.18	46.75	46.59
Maintenance of way and structures	$76,124	$80,077	$80,991
Maintenance of equipment	53,346	49,101	49,284
Traffic expenses	8,858	8,099	7,330
Transportation expenses	262,234	246,112	227,926
General expenses	57,876	59,077	55,991
Total operating expenses	$458,438	$442,466	$421,522
Net operating revenue	473,729	503,900	483,229
Outside operations (Sacandaga park)—Deficit	5,782	3,989	6,266
Total net revenue	$467,947	$499,911	$476,963
Taxes accrued	40,875	39,016	36,491
Operating income	$427,072	$460,895	$440,472
Other income	38,093	35,023	30,352
Gross corporate income	$465,165	$495,918	$470,324
Deductions from gross corporate income	363,504	361,614	353,650
Net income (available for dividends)	$101,661	$134,304	$117,174
Dividends on preferred stock	30,000	30,000	30,000
Dividends on common stock	50,000	50,000	50,000
Total dividends for year	$80,000	$80,000	$80,000
Balance to profit and loss	21,661	54,304	37,174

J. Ledlie Hees, the president, says in his statement to shareholders:

"The freight revenue from anthracite coal shows a decrease of $19,838 for the year owing to the recent coal strike, but the merchandise freight revenue shows an increase of $7,244. It is expected that the decrease in freight revenue from coal shown above will be offset by a corresponding increase the current year.

"While the operating expenses show an increase of $15,972, it will be noted that payroll items alone show an increase of $22,145.

"The company's payroll for the year amounted to $318,045, equal to 34.12 per cent of its gross revenue from operation and an increase over its payroll expense of the previous year of $22,145.

"For future improvements and additions to the property, the company has available the unissued $500,000 of preferred stock.

"Advances made to subsidiary companies on account of new construction during the year amounted to $36,378.

"Road and equipment account has been charged during the year with amounts aggregating $108,081.

"Passenger traffic on the electric division compared with previous years as follows:

Year.	Number.	Mileage.	Revenue.
1905	3,888,198	19,440,990	$384,698.60
1906	4,546,843	22,734,215	434,120.76
1907	5,033,855	25,169,095	478,311.00
1908	5,000,041	25,000,205	468,375.80
1909	4,893,647	24,468,235	474,720.09
1910	5,536,312	27,681,560	534,665.47
1911	5,827,561	29,137,805	560,881.26
1912	6,090,627	30,453,135	565,836.86

Paris Underground Railway

The report of the Paris (France) Underground Railway for the year ended Dec. 31, 1911, shows a large increase in business compared with the preceding year. Several extensions were constructed during the year and there were no such serious interruptions to traffic as the floods of 1910. At the end of the calendar year the system comprised 44 miles of track and there were 5262 employees, among whom $167,095 was divided in premiums for better service. The company has also furnished suitable dwellings for the employees and it is now constructing a five-story building with forty-seven three to four room apartments. This work in the interest of the employees has required the investment of about $200,000.

The gross earnings for the year ended Dec. 31, 1911, were $10,853,653 and the operating expenses $4,555,819. The ratio

of operating expenses to gross earnings was reduced from 42.83 per cent to 42.01 per cent. Of the net earnings the municipality of Paris received $3,564,882. After this deduction the company was able to pay a dividend of 21 francs on shares of a par value of 500 francs. In 1911 the company carried 305,311,995 passengers on 43,490,860 car miles compared with 251,701,253 passengers on 36,202,566 car miles in 1910. The maximum daily average of passengers carried during any month was 965,961 for December. The operating expenses of the company worked out as follows: General executive and office expenses, 1.58 per cent; cost of transportation, 18.66 per cent; cost of train operation, 27.01 per cent; cars and electrical energy, 41.18 per cent; maintenance of way and stations, 11.57 per cent.

Consolidation of Taylor Iron & Steel Company and William Wharton, Jr., & Company, Inc.

The Taylor-Wharton Iron & Steel Company has been incorporated as a consolidation of the Taylor Iron & Steel Company and William Wharton, Jr., & Company, Inc. The new company has $2,000,000 of 7 per cent cumulative preferred stock, of which $1,500,000 has been issued; $2,000,000 common stock, of which $750,000 has been issued, and $2,000,000 first mortgage purchase money sinking fund 6 per cent gold bonds, of which $1,250,000 have been issued. The bonds are secured by a first mortgage on the entire property of the company. According to a recent appraisal, the net assets of the company are equal to more than $4,800,000, of which $1,500,000 are net quick assets. A cumulative sinking fund will retire the entire issue before maturity.

The Taylor Iron & Steel Company has paid 7 per cent on its preferred stock since incorporation and varying dividends, extending as high as 10 per cent, on its common stock. William Wharton, Jr., & Company, Inc., has paid dividends on the capital stock almost continuously and has earned an average of 19 per cent annually on the outstanding capital stock for the last ten years.

An official letter from Knox Taylor, the president of the new company, states that the Taylor Iron & Steel Company was incorporated in 1891 to acquire the interests of the Taylor Iron Works. The business of William Wharton, Jr., & Company, Inc., was founded in the year 1859 and incorporated in 1887. Both of the organizations have been engaged in business successfully for the last fifty years. The organization of the Taylor Iron & Steel Company will be continued as the organization of the combined company. The corporate identity of William Wharton, Jr., & Company, Inc., will be continued and practically the entire active organization will be retained.

The new first mortgage bonds have been offered for sale at par and interest by the Equitable Trust Company and William Morris Imbrie & Company, of New York. They are due on Sept. 1, 1942, and are callable as a whole or in part on any interest date at 105 and accrued interest through the sinking fund.

Eighteen years ago the Wharton company first successfully introduced manganese steel into railway track work and obtained the sole right for the use of this metal for that purpose from the Taylor Iron & Steel Company, which was then and still is the only licensed maker in this country of the original Hadfield manganese steel. The principal designs and constructions for the introduction of manganese steel in track structures were developed by these companies.

Chicago & Milwaukee Electric Railroad, Chicago, Ill.—The sales of the Illinois and the Wisconsin divisions of the Chicago & Milwaukee Electric Railroad took place at Waukegan, Ill., and Racine, Wis., respectively, on Sept. 25, 1912. A plan of reorganization was agreed upon by the bondholders of both the Illinois and Wisconsin divisions previous to the sale, and to carry out this agreement the properties were bid in by Jacob Newman, representing the bondholders, who paid $1,650,000 for the Illinois division and $1,600,000 for the Wisconsin division. The bondholders arranged to meet on Oct. 4, 1912, to elect new directors and officers. It is understood that there will be an issue of $10,000,000 of bonds at 5 per cent to provide funds for betterments and new equipment and other corporate needs. It is also reported that arrangements have been made with the Northwestern Elevated Railroad by which the Chicago & Milwaukee Electric Railroad will operate from Evanston, where it now connects with the elevated railroad, into a downtown terminal over the elevated structure.

County Traction Company, Chicago, Ill.—Andrew Cooke, vice-president of the Harris Trust & Savings Bank, Chicago, Ill., is quoted in part as follows in regard to the status of the company in the wage readjustment arbitration in Chicago: "At the time of the organization of the Chicago Union Traction Company, under the name of the Chicago Railways, I obtained at foreclosure sale the old lines of the Consolidated Traction Company, and about that time I also, with my friends, obtained the bonds of the Cicero lines. The lines within the city limits I sold to Henry A. Blair and the representatives of the Chicago Railways, receiving in payment therefor securities of the Chicago Railways. The lines outside the city were kept by myself and my associates. We held them, and the bonds were deposited with the Harris Trust & Savings Bank. The cars, etc., were rented from the Chicago Railways. So far as repair work was concerned the County Traction Company did those repairs itself. We are not opposed to unions and will treat with the representatives of the men employed on our lines, but we will not tolerate interference by strangers who have nothing to do with our affairs. Our lines have never paid. We hope at some time to make them worth something, but if we are forced to we will tear up the tracks."

Des Moines (Ia.) City Railway.—The Des Moines City Railway has called for payment $25,000 of the first-mortgage gold bonds of the Des Moines Street Railroad dated Oct. 1, 1889, payment to be made at the office of the Continental & Commercial Trust & Savings Bank, Chicago, Ill.

Indiana Union Traction Company, Anderson, Ind.—In a ruling sustaining a demurrer to the complaint of Alexander M. Thomson and George J. Marott against the Union Traction Company of Indiana and the Indiana Union Traction Company, Judge Remster of the Marion Circuit Court on Sept. 20, 1912, held that the consolidation of the two companies is legal and was authorized by laws concerning street and interurban railways. The plaintiffs asked an injunction to set aside such action as had been taken toward the consolidation and for a receiver for the Indiana Union Traction Company.

Iowa Railway & Light Company, Cedar Rapids, Ia.—The Iowa Railway & Light Company, formerly the Cedar Rapids & Iowa City Railway & Light Company, has acquired the Marshalltown Light, Power & Railway Company, the Boone Electric Company, the Marion Light, Heat & Power Company, the Perry Electric Light, Power & Heating Company, the Tama & Toledo Railway and the Tama & Toledo Electric Power Company. The authorized capital stock of the Iowa Railway & Light Company is $6,000,000, of which $3,000,000 is 7 per cent cumulative preferred stock and $3,000,000 common. The company has outstanding $1,000,000 of preferred stock and $1,700,000 of common stock. The company has authorized an issue of $10,000,000 of first and refunding mortgage 5 per cent bonds, of which $1,687,000 is outstanding and $1,313,000 is reserved to retire a like amount of Cedar Rapids & Iowa City Railway & Light Company 5 per cent bonds. Harris, Forbes & Company, New York, N. Y., and the Harris Trust & Savings Bank, Chicago, Ill., trustee under the mortgage securing the bonds, are offering the $1,687,000 of bonds for subscription. The bonds are dated Aug. 30, 1912, and are due on Sept. 1, 1932, but are subject to redemption at 103 and interest on any interest date on or after Sept. 1, 1915. The same management which has conducted the Cedar Rapids & Iowa City Railway & Light Company is to continue in control of the Iowa Railway & Light Company.

Ohio Traction Company, Cincinnati, Ohio.—The Public Service Commission of Ohio on Sept. 23, 1912, refused to grant the application of the Ohio Traction Company, Cincinnati, Ohio, for authority to issue $750,000 of preferred stock, to be sold at $90 per share, to reimburse itself for expenditures from its income for extensions and improvements made and paid for before the application was filed. The expenditures, it is said, aggregated over $797,000.

Representatives of the company contended that the money which had been spent was an additional investment and that the stockholders should be reimbursed. The application of the company for authority to issue $750,000 of first mortgage collateral trust 5 per cent twenty-five-year bonds for the purpose of improving the property of the Cincinnati Traction Company was granted. The bonds are to be sold for 98. The company is required to report the sale of the bonds and the amount received for them and to make a detailed statement of the expenditures each month. The expenditure of the money is limited to the items named in the commissions order.

Philadelphia (Pa.) Rapid Transit Company.—Joseph E. Widener, who was re-elected a director of the Union Traction Company recently, has resigned because of ill health, and Thomas E. Mitten, chairman of the executive committee of the Philadelphia Rapid Transit Company, has been elected to succeed him.

Port Arthur (Tex.) Traction Company.—It was reported at Dayton, Ohio, on Sept. 25, 1912, that negotiations were pending for the sale of the property of the Port Arthur Traction Company, promoted by Harry J. Myers, 503 Reibold Building, Dayton, and his associates, to a Texas syndicate.

Puget Sound Traction, Light & Power Company, Seattle, Wash.—The stockholders of the Puget Sound Traction, Light & Power Company will, it is stated, vote on Oct. 16, 1912, to authorize an increase of $1,135,400 in the preferred stock of the company.

Santiago Electric Light & Traction Company, Santiago, Cuba.—Lawrence Turnure & Company, New York, N. Y., are offering to the public an issue of first mortgage 6 per cent gold bonds of the Santiago Electric Light & Traction Company. This offer is made at 98½ and interest. The bonds are due Jan. 1, 1959, and are redeemable at 105 and interest on any interest date after Jan. 1, 1919. Both the principal and interest are payable in gold at the office of the Equitable Trust Company, New York, the trustee under the mortgage. The company has announced that for the next two years it will turn its surplus earnings back into extensions and improvements. Frank Steinhart, president and general manager of the Havana Electric Light & Railway Company and representative of Speyer & Company in Cuba, will have general supervision of the Santiago Electric Light & Traction Company. The authorized capital stock of the company is $2,000,000, of which $1,500,000 has been issued, and there is an authorized bond issue of $2,500,000, of which only the offering noted has been issued.

Tidewater Southern Railroad, Stockton, Cal.—The Railroad Commission of California has rescinded its order of June 29, 1912, to permit the Tidewater Southern Railroad to issue $750,000 of bonds and $3,500,000 of stock upon the ground that the company in issuing the stock is not complying with the stipulations prescribed by the commission.

Washington, Baltimore & Annapolis Electric Railway, Baltimore, Md.—The following statement has been issued in Cleveland in regard to the initial dividend of 1½ per cent declared on the $1,460,000 of 6 per cent non-cumulative preferred stock of the Washington, Baltimore & Annapolis Electric Railway, referred to in the ELECTRIC RAILWAY JOURNAL of Sept. 28, 1912, page 512. "The directors have declared a dividend of 1½ per cent on the preferred stock, payable on Oct. 1, 1912, to holders of record of Sept. 24, but took no action as to the amount to be set aside for depreciation and deferred maintenance since the reorganization. The property has been thoroughly maintained, notwithstanding that the amount expended has been below the sum ordinarily spent by similar electric railways for such purposes. The demand upon the earnings since reorganization, for block signals, additional cars, freight terminals, substation equipment, etc., has been heavy, but necessary in order to care for the business. In consideration of these facts the directors deem it advisable to go through the present fiscal year so that after the necessary expenditures shall have been made during the fall for maintenance and to put the property in first-class condition for the winter the matter can be considered as a whole and action taken as to the proper amount to be set aside for depreciation and working capital."

Dividends Declared

Auburn & Syracuse Electric Railroad, Spracuse, N. Y., quarterly, 1½ per cent, preferred.

Boston & Suburban Electric Companies, Boston, Mass., quarterly, $1, preferred.

Cincinnati, Newport & Covington Light & Traction Company, Covington, Ky., quarterly, 1⅛ per cent, preferred; quarterly, 1⅜ per cent, common.

City Railway, Dayton, Ohio, quarterly, 1½ per cent, preferred; quarterly, 2 per cent, common.

Columbia Railway, Gas & Electric Company, Columbia, S. C., quarterly, 1½ per cent, preferred.

Columbus, Newark & Janesville Electric Railway, Newark, Ohio, quarterly, 1½ per cent, preferred.

Illinois Traction System, Peoria, Ill., quarterly, 1½ per cent, preferred.

Manchester Traction, Light & Power Company, Manchester, N. H., quarterly, 2 per cent.

Ohio Traction Company, Cincinnati, Ohio, quarterly, 1 per cent, common.

Public Service Investment Company, New York, N. Y., quarterly, 1½ per cent, preferred.

Porto Rico Railways, Ltd., Ponce, P. R., quarterly, 1¾ per cent, preferred; quarterly, 1 per cent, common.

Public Service Corporation of New Jersey, quarterly, 1½ per cent.

Rio de Janeiro Tramway, Light & Power Company, Rio de Janeiro, Brazil, quarterly, 1¼ per cent.

Sao Paulo Tramway, Light & Power Company, Sao Paulo, Brazil, quarterly, 2½ per cent.

Springfield & Xenia Railway, Springfield, Ohio, quarterly, 1½ per cent, preferred.

Union Railway, Gas & Electric Company, Rockford, Ill., quarterly, 1½ per cent, preferred.

United Light & Railways Company, Grand Rapids, Mich., quarterly, 1½ per cent, first preferred; quarterly, ¾ of 1 per cent, second preferred.

Virginia Railway & Power Company, Richmond, Va., 1 per cent, common.

Youngstown & Ohio River Railroad, Leetonia, Ohio, quarterly, 1⅛ per cent, preferred.

Winnipeg (Man.) Electric Railway, quarterly, 3 per cent.

ELECTRIC RAILWAY MONTHLY EARNINGS

BROCKTON & PLYMOUTH STREET RAILWAY.

Period.			Gross Earnings.	Operating Expenses.	Net Earnings.	Fixed Charges.	Net Surplus.
1m.,	July,	'12	$15,476	*$9,469	$6,006	$1,050	$4,956
1 "	"	'11	16,202	*8,967	7,235	1,080	6,155
12 "	"	'12	119,329	*89,802	29,527	12,576	16,951
12 "	"	'11	120,245	*89,373	30,872	13,312	17,560

GALVESTON-HOUSTON ELECTRIC COMPANY.

1m.,	July,	'12	$180,558	$100,556	$80,003	$33,501	$46,502
1 "	"	'11	136,113	*82,256	53,857	18,918	34,939
12 "	"	'12	1,778,397	*1,077,923	700,474	332,683	367,791
12 "	"	'11	1,430,166	*900,115	530,050	240,844	289,196

HOUGHTON COUNTY TRACTION COMPANY.

1m.,	July,	'12	$30,784	*$14,634	$16,149	$5,697	$10,472
1 "	"	'11	31,220	*16,185	15,035	5,226	9,809
12 "	"	'12	300,671	*178,625	122,046	64,920	57,126
12 "	"	'11	306,131	*177,070	129,061	62,835	66,226

NORTHERN TEXAS ELECTRIC COMPANY.

1m.,	July,	'12	$146,289	*$76,927	$69,363	$20,858	$48,505
1 "	"	'11	131,383	*71,301	60,082	21,168	38,913
12 "	"	'12	1,658,121	*899,655	758,467	251,454	507,012
12 "	"	'11	1,545,632	*849,612	696,019	231,251	464,768

PADUCAH TRACTION & LIGHT COMPANY.

1m.,	July,	'12	$22,874	*$14,013	$8,861	$7,192	$1,670
1 "	"	'11	22,477	*13,693	8,785	6,706	2,079
12 "	"	'12	277,349	*181,718	95,632	84,937	10,694
12 "	"	'11	257,759	*155,956	101,803	77,119	24,784

PENSACOLA ELECTRIC COMPANY.

1m.,	July,	'12	$24,389	*$14,693	$9,697	$6,377	$3,320
1 "	"	'11	25,320	*15,609	9,711	4,975	4,735
12 "	"	'12	285,100	*179,288	105,812	71,038	34,774
12 "	"	'11	285,249	*176,148	109,101	57,489	51,612

SAVANNAH ELECTRIC COMPANY.

1m.,	July,	'12	$61,406	*$44,894	$16,513	$16,313	$200
1 "	"	'11	64,039	*48,528	15,510	15,312	199
12 "	"	'12	726,793	*536,727	190,066	189,030	1,036
12 "	"	'11	666,945	*482,573	184,373	182,995	1,378

TAMPA ELECTRIC COMPANY.

1m.,	July,	'12	$63,181	*$32,340	$30,841	$4,365	$26,477
1 "	"	'11	57,253	*30,950	26,303	5,430	20,873
12 "	"	'12	732,567	*389,832	342,734	54,541	283,193
12 "	"	'11	621,111	*346,370	274,741	58,045	216,696

* Includes taxes.

Traffic and Transportation

Co-operation of Vehicle Owners Requested in Accident Prevention Work

The United Railways & Electric Company, Baltimore, Md., sent a letter recently, in part as follows, to the owners of all teams and automobiles in the territory reached by the company's lines:

"Our purpose in sending you this letter is to enlist your co-operation in our efforts to prevent collisions between your vehicles and cars of this company. This letter is suggested because serious and fatal accidents have occurred which could have been avoided if the occupants of the vehicles had exercised proper care for their own safety before attempting to drive upon the tracks.

"It is important when vehicles approach streets upon which cars are operated or when driving alongside of tracks, as, for instance, between the tracks and the curbstone, that drivers 'look and listen' before they attempt to cross or before they turn into the tracks. For their own safety drivers of vehicles should use that portion of the street between the tracks and the curbstone when it is possible to do so. Street cars weigh many tons and are operated upon tracks that are fixed, making it impossible for them to 'turn out.' It is suggested that lanterns be placed upon your vehicles between sunset and sunrise, particularly when driving on suburban roads, where vehicles cannot be readily seen.

"This company's constant effort is to train its employees to be cautious, but no matter how careful a motorman may be, there are times when he cannot prevent accidents to persons who carelessly place themselves and the vehicles in their care in danger, and we feel it is to your interest to caution your men to exercise the utmost care when driving on highways and streets upon which cars are operated.

"Drivers of vehicles and pedestrians at times meet with accidents because they do not take necessary precautions for their own safety. The maxim 'An ounce of prevention is worth a pound of cure' is certainly applicable to the question of accident prevention.

"We feel sure that you will receive this letter in the spirit in which it is written, and we suggest that you have it read to your employees and posted in a conspicuous place so that they may familiarize themselves with the precautionary measures outlined, which in our judgment will lessen accidents such as are referred to herein."

Mayor Gaynor of New York on the Near-Side Stop

Mayor Gaynor of New York has addressed to the Board of Aldermen a communication, in part as follows, in regard to two ordinances designed to govern the stopping of street cars in Brooklyn:

"These ordinances require the street cars in the borough of Brooklyn to stop with the dashboard at the near crossing to discharge or receive passengers. There is already an ordinance requiirng that method at many street crossings in Brooklyn. It has existed for several years.

"I do not think such an ordinance should exist unless the ordinance also provides that the company shall receive and discharge passengers on the front platform. It seems to me that you should put in the ordinance itself this requirement of ingress and egress by the front platform. I hope you will agree with me in this. I think it also worthy of consideration that if this method is a good one it ought to prevail all over the city and not merely in one borough. I hope that will also be considered by your committee and by your honorable body before final action is taken. If I can contribute in any way to aid in the consideration of the matter, I shall be very glad to do so, because it is one of great concern to the whole city."

Freight Right Granted in Ludlow.—The Railroad Commission of Massachusetts has authorized the Springfield (Mass.) Street Railway to act as a common carrier of freight in Ludlow.

Fare Reduction Asked in Massachusetts.—The committee on transportation of City Council of Salem, Mass., has petitioned the Railroad Commission to order a reduction in fares on the Bay State Street Railway between Salem and Lynn from 10 cents to 5 cents, to 10 cents on the Boston & Maine Railroad betwen the two points, and to 25 cents between Salem and Boston.

Reduction in Fare of School Children.—A reduction in the fare of school children has been put into force in Shelbyville, Ky., by the Louisville & Interurban Railroad, Louisville, Ky. The company has authorized a fare of 5 cents for a round trip within the corporate limits of Shelbyville for school children only on the days when school is in session. Saturday is also a special-fare day for the pupils of Science Hill School, a short distance out of Shelbyville.

Anti-Smoking Order in Brooklyn.—The Brooklyn (N. Y.) Rapid Transit Company has issued the following order: "Effective Oct. 1, 1912, smoking or the carrying of lighted pipes, cigars or cigarettes upon elevated structures or in or on cars is prohibited under the requirements of Sections 776, 776a and 778 of the Greater New York Charter. Persons violating this order are liable to arrest and upon conviction to fine or imprisonment or both. Trainmen will make every effort to enforce this regulation." The order has been posted conspicuously by the company.

Service Complaint Answered by Reading Transit Company.—The Reading (Pa.) Transit Company has filed with the State Railroad Commission an answer to the complaint concerning overcrowding of the first morning car from Wernersville to Reading. The company has added another car from Wernersville, which leaves within a few minutes of the first car. It is denied that the fare of 15 cents is excessive. The company, in answering the complaint that cars do not stop on the Womelsdorf division between Trent Avenue and Reading Boulevard, says that the distance between these points is about 570 ft.—all on a 7 per cent grade—and this makes it impossible to stop and maintain the schedule.

Obligation of Railroads to Provide Seats Qualified.—William C. Bruce, counsel to the Public Service Commission of Maryland, has qualified as follows an opinion which he rendered recently in regard to the obligation of the railroads which operate in Maryland to provide seats for passengers: "The public service law declares that adequate accommodations must be provided by corporations doing business within the State. Whether the United Railways & Electric Company, Baltimore, is providing 'adequate' service by running cars in which some passengers have to stand I will not say at this time. A specific complaint would have to be presented for determination. The Public Service Commission has the right to say what is and what is not adequate service. More consideration must be shown to the street railways than to the railroads. Distances traveled by passengers on the street railways are shorter and rush hours have to be dealt with. Those who board the street cars expect to put up with more inconveniences for the short ride than those who board a railroad train."

Cleveland Councilmen Discuss Trolley Freight Service.—At a public meeting of the City Council of Cleveland, Ohio, as a committee of the whole on Sept. 27, 1912, the proposed ordinance giving the interurban railways the right to use the tracks of the Cleveland Railway for the operation of freight cars at certain hours was discussed. Representatives of the Chamber of Commerce and the railways were present. Councilman Newell opposed the ordinance. He argued that since the steam railroads are elevating their tracks it would be unreasonable to allow the interurban railways to operate freight cars on the streets at any time. S. R. Mason stated that the Chamber of Commerce had canvassed 204 people who live on the streets over which freight cars would operate and that 169 of them were in favor of allowing the cars to be operated. Mayor Newton D. Baker now favors the ordinance. L. J. Wolf, president of the Western Ohio Railway, favored longer hours in which to haul the cars and objected to the charge of 50 cents per car mile for the use of the tracks, as provided by the ordinance. He said the usual method of making charges in other cities is to pay the city companies a pro rata share of the earnings, based upon the number of miles that the freight is hauled and the number of miles of city tracks that are used.

Personal Mention

Mr. A. L. Butler, who has been acting roadmaster of the elevated division of the Boston (Mass.) Elevated Railway, has been appointed roadmaster of that division.

Mr. Charles C. Harris has been appointed superintendent of the Cincinnati, Milford & Loveland Traction Company, Cincinnati, Ohio. Mr. Harris is a son of the late John Harris, who was for many years superintendent of the Cincinnati (Ohio) Street Railway.

Mr. George U. Clough has been appointed superintendent of Division 5, South Boston Lines, of the Boston (Mass.) Elevated Railway to succeed Mr. Nugent Fallon, resigned. Mr. Clough has been connected with the Boston Elevated Railway for twenty-seven years.

Mr. H. L. Patterson has resigned as chief engineer and general superintendent of light and power of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, to engage in the manufacture of porcelain insulators with the Pennsylvania China Company, Kittaning, Pa., of which he has been appointed general manager.

Mr. A. G. White, whose resignation from the Tri-State Railway & Electric Company, with headquarters at East Liverpool, Ohio, was noted in the Electric Railway Journal of Sept. 21, 1912, was engineer of maintenance of way of the company in charge of all new construction work and maintenance and not electrical engineer.

Mr. G. N. Lemmon has been temporarily appointed chief engineer of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio. Permanent appointment will be announced later, as on Nov. 1, 1912, Mr. Lemmon will become connected with the Railway & Industrial Engineering Company, Pittsburgh, Pa., as consulting electrical engineer.

Mr. Thomas F. Sullivan has been appointed roadmaster of the surface lines of the Boston (Mass.) Elevated Railway to succed Mr. Richard Hapgood, retired. Mr. Sullivan entered the employ of the Boston Elevated Railway in 1898, shortly after his return from Cuba at the close of the Spanish War. His first work was in the office of the road construction department of the company. For the last four years he has been assistant roadmaster under Mr. Hapgood.

Mr. P. B. Sawyer, whose appointment to the operating department of the Electric Bond & Share Company, New York, N. Y., was noted in the Electric Railway Journal of July 27, 1912, has been elected vice-president and general manager of the Telluride Power Company, Salt Lake City, Utah, which supplies energy to the public utilities of Salt Lake City, Provo and Ogden. Mr. Sawyer succeeds Mr. L. L. Nunn, who resigned on Aug. 13, 1912.

Mr. Richard Hapgood has retired as roadmaster of the surface lines of the Boston (Mass.) Elevated Railway after having served the company and its predecessors for fifty-four years. Mr. Hapgood went to work for the Union Railway as a stableman in the winter of 1858. This was only a couple of years after the opening of the railway between Boston and Cambridge, the beginning of the present system of rapid transit in Boston. Mr. Hapgood served in turn as driver, conductor, starter, assistant superintendent and superintendent of the Union Railway. His appointment to the position of superintendent was made in 1872 and he retained the position until 1885, when he resigned and went West to benefit his health. He was succeeded in his position by Major-General William A. Bancroft, president of the Boston Elevated Railway, who at that time was a young lawyer. Mr. Hapgood returned to Boston about a year and a half later to become roadmaster of the consolidated street railway. A year later he was appointed superintendent of the South Boston Railway, and when the South Boston Railway was merged with the West End Street Railway he remained in the service as superintendent of the South Boston division, succeeding General Bancroft, who became roadmaster of the West End Street Railway. In 1892 Mr. Hapgood was appointed roadmaster of the West End Street Ralway. Under the later designation of superintendent of tracks he has continued in this position through all the more recent developments under the management of the Boston Elevated Railway.

Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

RECENT INCORPORATIONS

***Florida Interurban Railway & Tunnel Company, Jacksonville, Fla.**—Application for a charter has been made by this company in Florida to build an electric railway from Jacksonville to Pablo Beach and St. Augustine, about 45 miles, including branches, besides a tunnel or tunnels under the St. John's River between Jacksonville and South Jacksonville. Capital, $2,000,000. Incorporators: M. W. Bates, president; John S. Mabry, vice-president; William R. Letcher, secretary; G. G. Dowling, treasurer, and R. B. Harrison, all of Jacksonville.

***Centralia (Ill.) Traction Company.**—Chartered in Illinois to build an electric railway from Broadway, in Centralia, to the new Illinois Central Railroad yards in Washington County. Principal office, Centralia. Capital stock, $25,000. The incorporators and first board of directors are: John Langenfeld, Max Prill, Martin Beck, John Kihnlein and Charles C. Baldwin, all of Centralia.

***Mississippi Valley Traction Company, Springfield, Ill.**—Incorporated in Illinois to build an electric railway from Springfield to Quincy through the counties of Menard, Cass, Schuyler and Brown. Capital stock, $2,500. The incorporators and first board of directors are: George M. Skelley, W. S. Campbell and C. F. Smith, Springfield; Edward C. Creager, Kent, Ohio, and Johnson M. Creager, Youngstown, Ohio.

***Great Falls & Teton County Railway, Choteau, Mont.**—Application for a charter has been made by this company in Montana to build an interurban railway into Choteau with its eastern terminus at some point on the Shelby line of the Great Northern Railroad. Capital stock, $500,000. S. S. Hobson, Lewistown, president; Frank W. Mitchell, Stanford, and Philip I. Cole, Choteau, directors.

***Pennsylvania Traction Company, Elwood City, Pa.**—Application for a charter has been made by this company in Pennsylvania to build an electric railway to connect Wolfcreek, Worth, Sandy Lake and Stoneboro. This line will be an extension of the Slippery Rock-Grove City Street Railway, Grove City, which is now under construction.

***Frankstown Avenue Extension Street Railway, Pittsburgh, Pa.**—Chartered in Pennsylvania to build an electric railway in Pittsburgh. Capital stock is $12,000.

FRANCHISES

Tuscaloosa, Ala.—The City Commissioners are said to have accepted the proposition of Fred S. Morris, of Morris Brothers, bankers, Philadelphia, to electrify the Tuscaloosa Belt Line. [E. R. J., Sept. 28, '12.]

Los Angeles, Cal.—The Los Angeles Railway has asked the Council for a franchise on South Main Street from Moneta Avenue to Manchester Avenue in Los Angeles.

Los Angeles, Cal.—The City Council has passed an ordinance which calls for the advertising for sale on Oct. 8 of a franchise for an electric railway on San Pedro Street between Ninth and Aliso Streets, Los Angeles.

Monterey, Cal.—The Pacific Grove & Monterey Railway, Monterey, has asked the Council for a fifty-year franchise in Monterey.

Pomona, Cal.—The Pacific Electric Railway has received a fifty-year franchise from the Council in Pomona.

Stockton, Cal.—The Stockton Electric Railroad has asked the Council for a franchise in Stockton.

***South Jacksonville, Fla.**—The City Council has granted a franchise to M. W. Bates, G. G. Dowling, William R. Letcher, John S. Mabry and R. B. Harrison for an electric railway in South Jacksonville. It is the intention of the promoters to establish an interurban line between South Jacksonville and the beach resorts as noted in the department "Recent Incorporations," elsewhere in this issue.

***Holly, Mich.**—The Independent Power Company has received a franchise in Holly. The company plans to build

an electric railway from Pontiac to Owosso, via Holly, Fenton, Linden, Gaines and Durand. George C. Webber, Linden, is interested.

Hamilton, Ohio.—The County Commissioners have awarded a contract for the construction of a new canal bridge at High Street over the canal in Hamilton. As soon as the bridge is built the Ohio Electric Railway will ask for a franchise to cross the bridge and extend its lines through East Hamilton.

Philadelphia, Pa.—The committee of Councils on street railways has reported favorably for the Philadelphia Rapid Transit Company franchises for extension for two of its subsidiary companies, one permitting the Green & Coates Street Passenger Railway to lay single tracks on the north side of Pennsylvania Avenue from Green Street to Twenty-fifth Street, and the other permitting the Twenty-second Street and Allegheny Avenue Passenger Railway to lay tracks from its Wayne Avenue terminus east on Sherman and Carpenter Streets.

Richmond, Va.—The Richmond & Henrico Railway, Richmond, has asked the Commissioners of Chesterfield County for a franchise to extend its lines into the county. The company proposes to build a bridge over the James River and to extend its lines to Forest Hill and Swansboro.

Spokane, Wash.—The Spokane & Inland Empire Railroad, Spokane, has asked the City Commissioners for a six months' extension of its franchise for the Post Street extension north on Madison Street from the present terminus at Heroy Avenue to Queen Avenue in Spokane.

Wenatchee, Wash.—The Wenatchee Valley Railway & Power Company, Wenatchee, has received an extension of six months' time in which to begin the construction of its line in Wenatchee. A. J. Linville, Wenatchee, president. [E. R. J., March 30, '12.]

Superior, Wis.—The Superior Interurban Traction Company has asked the Council for a thirty-year franchise for its line in Superior. H. E. Voight, Superior, is interested. [E. R. J., Aug. 3, '12.]

TRACK AND ROADWAY

***Fresno, Cal.**—J. B. Rogers, San Francisco, has obtained right-of-way for an electric railway from Fresno to Barstow Colony and Lathrop.

Los Angeles Municipal Railroad, Los Angeles, Cal.—Work has been begun by this company on its line from the city proper to the harbor district of Los Angeles. [E. R. J., Sept. 14, '12.]

Pacific Electric Railway, Los Angeles, Cal.—This company will build at once an extension of its Arrowhead car line in San Bernardino.

Geary Street Municipal Railway, San Francisco, Cal.—The Board of Public Works has awarded to the United States Steel Products Company the contract for supplying special track connections needed for this line; also the contract for furnishing the trolley poles.

Stockton (Cal.) Electric Railway.—An extension will be built by this company of its line on Ophir Street from Main Street to North Street in Stockton.

Vallejo & Northern Railway, Vallejo, Cal.—Work has been begun by this company for its double-track line on M Street in Sacramento.

Sacramento Valley West Side Electric Railway, Willows, Cal.—Surveys have been begun by this company from Woodland to Denverton. The work is being done by the Dozier Construction Company. At Denverton the line will join the Oakland & Antioch Railroad, over which the Sacramento Valley West Line Electric Railway has the right to run its trains. Sacramento offices of the company have been opened in the Forum Building in the charge of Dumas & Brewer. [E. R. J., Aug. 31, '12.]

***Minturn, Col.**—The Chowchilla Ranch Company plans to build an electric railway to connect Minturn and its own property with the Tidewater Southern, a distance of 16 miles.

New York, New Haven & Hartford Railroad, Stamford, Conn.—This company has begun preliminary work upon the double tracking of the Danbury-Brookfield Junction branch of its lines between Berkshire Junction and Brookfield Junction, and it is said that from Brookfield Junction the double tracking will be extended to New Milford.

Valdosta (Ga.) Street Railway.—Contracts will soon be awarded by this company for the construction of a belt line in Valdosta.

Indiana Northwestern Traction Company, Monticello, Ind.—It is reported that this company plans to award contracts soon for the construction of its line south to Rensselaer. H. J. Wilson, Rensselaer, Ind., chief engineer.

***Cincinnati, Louisville, Lexington & Maysville Traction Company, Dry Ridge, Ky.**—This company has completed the grading of its line between Jonesville and Owenton.

Louisville (Ky.) Railway.—This company has completed and will soon place in operation its extension to Douglas Boulevard in the eastern section of Louisville. Work upon this extension has been under way for about a year.

Kentucky Southwestern Electric Railway, Light & Power Company, Paducah, Ky.—G. C. Calhoun, chief engineer of this company, has completed negotiations with the citizens of Murray and Calloway County, Ky., and will survey a route for an electric railway between Mayfield and Murray. The Calloway citizens have made up a substantial cash guaranty to assist in the survey of the new division in the company's properties. [E. R. J., Sept. 7, '12.]

Worcester (Mass.) Consolidated Street Railway.—This company has placed in operation its new Granite Street extension in Worcester.

Worcester (Mass.) Consolidated Street Railway.—This company has completed the extension of its Providence Street line in Worcester.

Eastern Shore Power, Light & Railway Company, Annapolis, Md.—A ¼-mile bridge will be built by this company at Deal Island and another bridge across the Pocomoke River at Snow Hill in connection with its line from Deal Island to Sinepuxent Bay. Lewis M. Milbourne, Princess Bay, Md., president. [E. R. J., Sept. 21, '12.]

***Linden, Mich.**—George C. Webber, Linden, is authority for the statement that the right-of-way for an electric line between Holly and Owosso, with a possible extension to Pontiac, has been secured. Water-power at Argentine, Byron, Linden and Holly is available, and it is the intention to develop sufficient current to light the towns through which the line will pass as well as furnish power for operation. O. H. Lee, Detroit, who promoted the Detroit, Rochester, Romeo, Lake Orion & Flint Railroad, is said to be interested in this proposition.

Joplin & Pittsburg Railway, Joplin, Mo.—Arrangements have been made and work will soon be begun by this company for an extension to Cunningham Park, Joplin.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company has been asked to consider plans to extend its Westside Hanscom Park line south and east to join the South Omaha L Street line at Thirty-second Street, Omaha.

Public Service Railway, Newark, N. J.—This company has awarded contracts for the construction of the new line between New Brunswick and Elizabeth.

***Dayton, Ohio.**—P. E. Sullivan, Joseph Green and George Danneker are considering plans for an electric railway in East Highland, a suburb of Dayton.

Toledo, Ann Arbor & Jackson Railway, Toledo, Ohio.—This company's track for its line between Toledo and Petersburg has been completed, and as soon as the derailing device for the crossing of the Toledo Terminal Railroad is received and put into place a gasoline motor car will be put into operation between the two points. In the meantime, the overhead work will be completed and electric cars will be put into operation in the spring. Arrangements have been made for the use of a short section of the Toledo & Western Railroad's tracks to form the connection with the local lines in Toledo.

Oklahoma City (Okla.) Traction Company.—Plans are being considered by this company for an extension on Robinson Avenue between Main Street and Fifth Street.

***Hood River, Ore.**—A. Welch, of the Oregon-Washington Corporation, and associates plan to build an electric railway through the Hood River Valley, and it is reported

that a franchise will soon be asked of the City Council. This line will ultimately be extended to The Dalles by this route.

Hanover & McSherrystown Street Railway, Hanover, Pa.—This company has completed surveys for its proposed extension from McSherrystown to New Oxford and Gettysburg.

Northwestern Railways Company, Meadville, Pa.—This company plans to build a line from Grove City to Sandy Lake.

Philadelphia & West Chester Traction Company, Philadelphia, Pa.—Plans are being formulated by this company for the continuation of its new extension to Media to Chester, thus giving the two towns a connection with the elevated road at Sixty-ninth Street and Market Street, Philadelphia.

West Penn Traction & Water Power Company, Pittsburgh, Pa.—This company has begun work on several important additions to its present railway system. Franchises and right-of-way have been secured and contract let for a railway to connect Latrobe with the main line of the interurban railway between Connellsville and Greensburg at the Hecla Works of the Frick Coal & Coke Company. This link will connect with the upper Connellsville region and give through service from Latrobe and Greensburg to the southern part of Fayette County. Surveys are being made for a line to extend from Hunker to West Newton and another from West Newton to Scott Haven. These lines will connect the interurban divisions with the McKeesport division. They will be approximately 15 miles in length and will put Greensburg in direct rail communication with the towns in the lower part of Westmoreland County.

Wilkes-Barre & Wyoming Valley Traction Company, Wilkes-Barre, Pa.—This company will double-track its line from Vaughn's Corners, Doranceton, to Harvey's Lake.

Montreal (Que.) Tramways.—Right-of-way has been obtained and plans are being made by this company to extend several of its lines.

Rhode Island Company, Providence, R. I.—Work has been begun by this company to lay a double track on Plainfield Street in Providence.

***Nashville, Tenn.**—William Burke, of New York, N. Y., and Richard T. Wilson, of Nashville, Tenn., recently visited Murfreesboro, Tenn., for the purpose of working up the Murfreesboro end of an undertaking which is to provide a railway connection between that city and Nashville in the immediate future. A route is to be surveyed from Nashville to Murfreesboro and thence on to Woodbury. H. J. Parkes is handling the railway project in Murfreesboro.

San Benito & Rio Grande Valley Interurban Railway, San Benito, Tex.—This company has changed its name to San Benito & Rio Grande Valley Railway Company. A. Robertson, San Benito, Tex., is president, and E. E. McLellan chief engineer.

Waco (Tex.) Street Railway.—Contracts will soon be awarded by this company to build an extension of its Provident Heights line to Highland Place.

Ogden (Utah) Rapid Transit Company.—This company has awarded the contract for grading its extension through Ogden Canyon to Henry West.

Utah Light & Railway Company, Salt Lake City, Utah.—This company has awarded a contract for the construction of a line to Black Hawk and Moreland to the Utah Construction Company, Ogden, Utah.

Utah & Salt Lake Electric Railway, Salt Lake City, Utah.—Work will be begun at once by this company in Provo. The line will connect Salt Lake City, Payson, Provo, Lehi, Spanish Fork and Springville. A. J. Evans is interested. [E. R. J., Sept. 21, '12.]

Spokane & Inland Empire Railroad, Spokane, Wash.—This company has placed in operation the 1½-mile line extension of its line that extends past Manito Park and Cannon Hill Park in Spokane.

SHOPS AND BUILDINGS

Louisville (Ky.) Railway.—Plans for the additional improvement of a tract of about 10 acres of land secured not long ago by this company are nearing completion. The company has erected a carhouse and employees' headquarters on the site, which will eventually be the chief property of the company. Plans are now being completed for the erection of an addition to the present carhouse, as well as the equipment of car repair and remodeling shops. The plant for repairing cars will include a paint shop, carpenter shop, foundry and accommodations for storing all excess supplies of the line. It is stated that repair work will be done exclusively.

Piedmont Traction Company, Charlotte, N. C.—A repair shop will be built by this company at Pinoca.

North Carolina Public Service Company, Salisbury, N. C.—This company will build a carhouse in Concord.

Scioto Valley Traction Company, Columbus, Ohio.—The stockholders of this company have authorized the directors to finance the company that plans to build an interurban terminal depot at Rich and Wall Streets, in Columbus. It is estimated that the improvement will entail a cost of about $500,000. Much of the land has already been secured and it is said that the remainder can be obtained without resort to condemnation proceedings. It has been planned to have an entrance from Town Street, so that cars will be able to use the loop instead of turning at some other point.

Pittsburgh (Pa.) Railways.—This company has purchased 5 acres of land located between Ohio Street and the tracks of the West Penn Railroad in Millvale. It will be utilized as a site for new carhouse and repair shops.

West Penn Traction & Water Power Company, Pittsburgh, Pa.—This company is increasing the capacity of its carhouses at Uniontown and Connellsville. It is building a new carhouse at Kittanning and a terminal station at Uniontown.

San Benito & Rio Grande Valley Railroad, San Benito, Tex.—The San Benito & Rio Grande Valley Railway plans to build a new concrete passenger station at San Benito to be used jointly by that company and the St. Louis, Brownsville & Mexico Railway.

POWER HOUSES AND SUBSTATIONS.

Chicago (Ill.) City Railway.—This company's old power plant, covering a ground area of an entire block, bounded by Forty-eighth Place, Forty-ninth Street, Leavitt Street and Oakley Avenue, in Chicago, has been purchased by the Lambert Car Manufacturing Company.

United Railways & Electric Company, St. Louis, Mo.—A new substation will be built by this company to transform water power received from the Mississippi River Power Company's water-power development on Mississippi River, Keokuk, Ia. The structure will be of brick with terra-cotta trimming and concrete roof. It will be 45 ft. x 90 ft. and have a capacity of 10,000 hp in transforming apparatus. The estimated cost will be $35,000.

Laurel Park Street Railway, Hendersonville, N. C.—A new power plant will be built by this company at the Transylvania Railroad crossing in Hendersonville.

Trenton, Bristol & Philadelphia Street Railway, Bristol, Pa.—This company is making a number of improvements to its power station.

Pittsburgh & Butler Street Railway, Butler, Pa.—The contract to build the addition to the substation of this company on Sullivan Avenue, Butler, has been let to the George Schenck Company, of Butler. The addition will be 20 ft. x 40 ft., one story high, brick and fireproof construction.

West Penn Traction & Water Power Company, Pittsburgh, Pa.—This company is erecting a new substation extension to its power plant at Kittanning and has recently added to the equipment at Butler, Washington and other points. Contracts have been let for the construction of substations at Vandegrift and Freeport.

Eastern Texas Traction Company, Greenville, Tex.—It is reported that this company plans to build a new power house in Greenville.

Tyler Electric Light & Power Company, Tyler, Tex.—Construction will be begun at once by this company of a new power house in Tyler. The structure will be of brick and have sufficient space to store eight cars, besides power station equipment and room for offices.

Manufactures and Supplies

ROLLING STOCK

Lincoln (Neb.) Traction Company, it is reported, will purchase four new cars.

Public Utilities Company, Evansville, Ind., has ordered five cars from the Cincinnati Car Company.

Union Traction Company of Indiana, Anderson, Ind., has ordered six cars from the Cincinnati Car Company.

Union Street Railway, New Bedford, Mass., has ordered a snow plow from the Russell Car & Snow Plow Company, Ridgway, Pa.

Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind., has ordered nineteen cars from the Cincinnati Car Company.

TRADE NOTES

Bridgeport Brass Company, Bridgeport, Conn., calls attention to the fact that it has supplied a great deal of phono-electric wire to the electric railways which operate in Chicago.

G. Drouvé Company, Bridgeport, Conn., has been conspicuous in the equipment of Chicago carhouses. Altogether this company has supplied about 75,000 sq. ft. of skylights to carhouses of the Chicago City Railway and Chicago Railways.

Cambria Steel Company, Johnstown, Pa., has elected W. H. Donner its president to succeed C. S. Price, resigned. J. Leonard Replogle, since March, 1910, assistant to the president of the company, has been elected vice-president in charge of operation and sales.

Western Electric Company, New York, N. Y., has taken over the business of the Cleveland Electrical Supply Company, Cleveland, Ohio, and has opened a branch office at 724 Prospect Avenue, Cleveland, the former address of the supply company. H. A. Speh, formerly in the Buffalo (N. Y.) office of the Western Electric Company, has been made manager.

Dodwell & Company, Ltd., have recently opened their own office in New York, George W. Lane & Company, Inc., their late agents, having gone into voluntary liquidation. The New York office is located at 135 Front Street. George M. Dodwell is manager and Paul L. Phelan is submanager. Fred Dodwell, a director of the company, will also remain in New York for the present.

George Herman Anger, Preston, England, has recently received orders for Anger improved automatic brake adjusters from many lines in South America, also in Bolton, Oldham, Salford, Hastings and Portsmouth, England. The tramways of Blackpool and Preston, England, are now being equipped with this type of adjuster. Mr. Anger now has offices and representatives in Glasgow, Dublin, London, Brussels and Paris.

Barber Car Company, York, Pa., has delivered a gasoline-electric car to the Preston Car & Coach Company, Preston, Ont., which has purchased the Canadian manufacturing rights. The car was operated between Berlin, Preston and Galt on the tracks of the Galt, Preston & Hespeler Electric Railway. It has a seating capacity of 40 persons and is geared for a maximum speed of about 30 m.p.h. This car has been sold to the Canadian Northern Railway for operation on its lines.

Henry N. Ransom resigned on Aug. 1 from the air-brake department of the General Electric Company to become manager of sales of the Near-Side Car Company and of the Dayton Fare Recorder Company, with headquarters in the Land Title Building, Philadelphia. Mr. Ransom began his career in the electric railway field with the Consolidated Car Heating Company in 1893. In 1899 he left that company to become connected with the International Railway, Buffalo, N. Y., as purchasing agent, which position he held until 1902. From 1902 to 1905 he was with the Christensen Engineering Company. For the last seven years Mr. Ransom has had charge of sales in the air-brake department of the General Electric Company.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has appointed J. McA. Duncan manager of the Pittsburgh district to succeed W. F. Fowler, who has resigned to accept a position with the W. S. Kuhn Corporation. The Pittsburgh sales office has charge of all the sales for the Pittsburgh district. Mr. Duncan has been in the employ of the Westinghouse Electric & Manufacturing Company for about twenty-five years, and is one of the original group of eight men taken from the Union Switch & Signal Company, then located on Garrison Alley, Pittsburgh, to form the Westinghouse Electric & Manufacturing Company, which was established at the same place. His first position was in the shipping department, and later he was placed in the correspondence department, of which he was afterward placed in charge. In 1906 Mr. Duncan was placed in charge of the price department. For a year or two he was located in the New York office on some special work in connection with the costs. Mr. Duncan then returned to East Pittsburgh and was attached to the manager of works' office as director of costs, and later as assistant manager of works in charge of production and costs. Last spring, when the present revival of industry began, the increased activity resulting from the additional business secured necessitated a division of work, and Mr. Duncan was appointed director of works accounting. He has assumed his new duties with the office in the Union Bank Building, Pittsburgh, Pa. The Westinghouse Electric & Manufacturing Company has received the following orders for railway motors: Cincinnati (Ohio) Traction Company, fifty double equipments of No. 318 motors and K-40-A single-end control; Peninsular Railway, San Jose, Cal., eight quadruple equipments of No. 333-B-2 motors designed for operation on 600-1200-volt circuits with A-L-F control; Pacific Electric Railway, Los Angeles, Cal., forty-five quadruple equipments of No. 333-B-2 motors for operation on 600-1200-volt circuits with A-L-F control.

ADVERTISING LITERATURE

Tacchella & Krieger, St. Louis, Mo., have issued Bulletin No. 4, in which the Tacchella oil-burning device is described and illustrated.

New Jersey Foundry & Machine Company, New York, N. Y., has issued a circular which illustrates various types of its cranes, tracks, trolleys and hoists.

Vulcan Engineering Sales Company, Chicago, Ill., has published several circulars in which Q M S pneumatic hoists, traveling cranes and jib cranes are described and illustrated.

Brown Hoisting Machinery Company, Cleveland, Ohio, has issued Catalog E, which describes and illustrates a complete line of Brownhoist grab buckets, slag buckets, contractors' grab buckets, drag-line buckets, shovel buckets and various kinds of tubs as designed and manufactured by the company.

Pure Carbon Company, Wellsville, N. Y., has issued a 24-page catalog which describes its tungsten carbon brushes for motors and generators. List prices are included in catalog. Attention is called to the company's engineering department, which has been established for the aid of engineers and others experiencing difficulties with carbon and graphite brushes. The Pure Carbon Company has also issued two folders dealing with its product.

NEW PUBLICATION

Earning Power of Railroads, 1912. By Floyd W. Mundy, of James H. Oliphant & Company. Moody's Magazine Book Department, New York. Cloth, 526 pages. Price, $2.50.

An edition of this book has now been issued annually for eleven years. It is a statistical compilation of the earnings, expenses, mileage, capitalization, etc., together with expenditures and unit results, of the principal steam railroads of the country. The figures of capitalization and the principal items of revenue and expense are shown both in the total and per mile. One of the tables in the statistical compilations of the various roads shows the percentage of gross income applied for maintenance expenses, traffic, transportation and general expenses, fixed charges and surplus. The text, in addition to the explanation which it furnishes regarding the tables, gives a summary of the principal recent events affecting the property.

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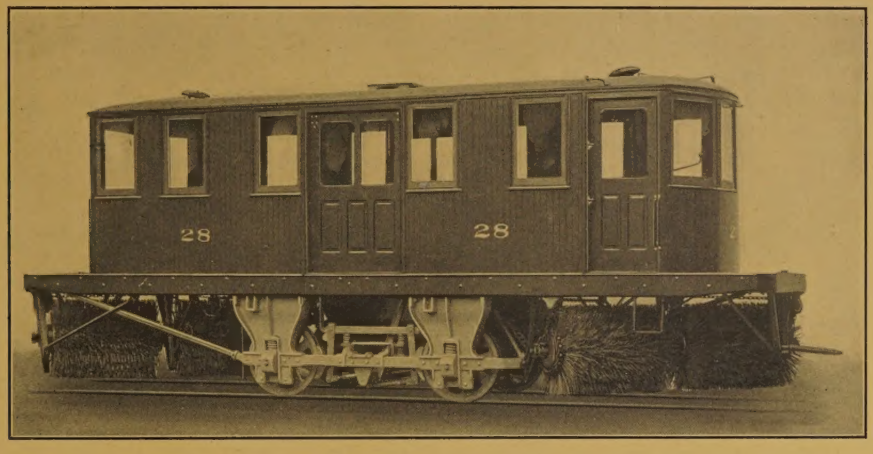

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